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DIABETES MELLITUS AND PREGNANCY.

By D. R. SHEUMACK,

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THE problem presented by pregnancy complicating an established case of *diabetes mellitus* has always been one of interest to both the obstetrician and the physician. In the following paper, an attempt will be made to illustrate the various complications with appropriate brief case histories of the patients who have come under care at the Royal Hospital for Women during the years 1946 to 1948. In addition, a survey will be given of all the diabetics who have attended the obstetrics division of this hospital from 1935 to 1948. All told, the association of diabetes and pregnancy has been found in only 45 cases out of a total of approximately 38,611 confinements. This proportion is somewhat in excess of that anticipated, for according to Joslin, about one woman in 1000 of child-bearing age is a diabetic.

It is of interest to note that the number of diabetics who have been confined during the years 1947 and 1948 is far in excess of the number confined over any other two-year period (see Table I). This is undoubtedly due to careful investigations carried out on all pregnant patients who show at any period of their pregnancy the presence of a reducing substance in the urine. The procedure at present adopted for such a patient is first to perform a fermentation test to exclude lactosuria, then, if a reducing substance other than lactose is present, to perform a glucose tolerance test. In this way a significant number of early cases of *diabetes mellitus* have been diagnosed. Before some of the more recent views on the subject are mentioned, a brief historical survey should prove of interest.

THE PRE-INSULIN ERA.

It is reasonable to assert that, prior to the discovery of insulin in 1921, the majority of proven diabetic women never succeeded in becoming pregnant. Bennewitz in 1826 was apparently the first to record a case. This was that of a woman who suffered from intense thirst and polyuria during three successive pregnancies. In respect to this case, he states that "the taste of the urine resembled beer, but was much sweeter", and that the urine contained "2 ozs. of saccharine matter per pound". A second case was recorded by Leaver in 1847. In 1882, J. Matthews Duncan in truly dramatic style portrayed the pitiful state of the pregnant diabetic. Of 16 cases reviewed, the patients in four died soon after delivery. Moreover, this was coupled with a high fœtal mortality rate of 47%. With one of his patients, "the thirst became frightful and being refused water by the nurse, she crept on her hands and knees to the water bottle". A larger series was reviewed by J. Whitridge Williams in 1909. In this series of 66 pregnancies in 43 diabetics, 27% of the mothers died either during labour or during the puerperium, and a further 23% succumbed during the ensuing two years. The fœtal mortality rate in this group was 41%. In some of the German series published by Offergeld, the results are even more distasteful. Here, the immediate maternal mortality reached 30% and the fœtal mortality 62%. Undoubtedly the major cause of maternal mortality in these series was an uncontrollable diabetic coma. The possibilities as to the cause of the high fœtal mortality will be mentioned later.

The reason for the rather fortunate infertility of diabetics during this period has always been a subject of debate. It is known, however, that amenorrhœa and other types of menstrual dysfunction were common. Parisot placed the incidence of amenorrhœa at 50% and stated that it was associated with disappearance of the Graafian follicles. The inference that the severely diabetic woman never menstruates normally must be vigorously eschewed, for the literature contains innumerable

examples of perfectly normal menstrual function in even the severest diabetes. Other anomalies of the genital system which would lessen the possibility of conception are also described. Von Graefe mentions atrophy of the uterus, and more recently Priscilla White and her associates have observed at autopsy lack of development of the genital tract in four young patients whose diabetes was of long standing.

Recent research work in the realm of endocrinology has shown that, in all probability, the underlying cause of the infertility was aberrant function of the *pars anterior* of the pituitary gland. In addition to the latter, it is likely that the nutritional inadequacy which frequently resulted from the restricted diets so necessary to control the diabetes played no mean part.

The above survey is really of more than historic interest, for it depicts the train of events which may follow, even in these days of enlightenment, if the diabetic is permitted to pursue an uncontrolled course during pregnancy. To recapitulate, untreated diabetes and pregnancy are basically incompatible.

THE INSULIN ERA.

The routine adoption of insulin in the treatment of patients with diabetes uncontrolled by diet alone has resulted in a reversion of the maternal mortality to virtually that pertaining among the non-diabetic. The other great problem of the pre-insulin era, namely, infertility, has also disappeared—so much so that, at the present time, the diabetic woman who requires investigation for sterility is the exception rather than the rule. Skipper mentions a diabetic in whom menstruation, absent for ten years, returned when the patient received adequate insulin therapy. Fitz, Murphy and Bowen have each reported a case in which secondary amenorrhœa of two years' duration was followed, after treatment with insulin, by menstruation and later by pregnancy.

Effects of Pregnancy in the Diabetic.

Even in the diabetic readily controlled by insulin, however, the advent of pregnancy results in the commencement of an endocrine upheaval absolutely without counterpart in the non-pregnant state.

The disruptive factors result in the following effects: (i) changes in carbohydrate metabolism, (ii) increased tendency to ketosis, (iii) water retention, and (iv) imbalance of the sex hormones of pregnancy.

These four features will now be discussed in more detail.

Changes in Carbohydrate Metabolism.

The sugar tolerance is very frequently diminished. In the majority of instances, this unpredictable change occurs during the latter half of pregnancy. Skipper, who carefully observed 18 pregnancies in 17 diabetic women, found that in 13 the diabetes undoubtedly became worse during the latter months of pregnancy. This lowering of sugar tolerance results in an increased call on the insulin quota. The feature just mentioned has been remarkably constant in the cases of diabetes treated at the Royal Hospital for Women over the past two years. In one of the most severe cases (Case 34), the insulin quota was increased from the early pregnancy requirement of 70 units per day to 160 units per day during the third trimester. The change is thought to be due to hyperactivity of the pituitary gland.

Further, it has been found that during pregnancy there is frequently a lowering of the renal threshold to glucose. Whereas in the non-pregnant state the threshold usually lies between 150 and 180 milligrammes *per centum* in the pregnant state excretion of sugar in the urine may appear when the blood sugar level is as low as 120 milligrammes *per centum*. This condition of renal glycosuria, according to Lambie, occurs in approximately 45% of pregnant women. It is most common during the sixth and seventh months and disappears towards the end of pregnancy or during the early puerperal period. The condition is also known to exist apart from pregnancy and Graham mentions its presence in 1% of otherwise healthy people. Renal glycosuria, therefore, must be remembered, for its occurrence in the diabetic is likely to add to the difficulties in the control of the patient.

In rarer instances, the sugar tolerance is increased. An attractive theory, which has recently fallen into some disrepute, was that insulin elaborated by the fœtal pancreas passed into the maternal circulation via the placenta. Although hypertrophy of the islets of Langerhans has been observed in stillborn infants of diabetic mothers, it has yet to be proved that amelioration of symptoms is due to activity of the fœtal pancreas.

Two other factors are of importance. Firstly, vomiting, which is so common in the first trimester, may result in the failure to absorb adequate carbohydrate from the gastro-intestinal tract. This may for a time simulate raised sugar tolerance and in some cases provoke acidosis. Secondly, the muscular exertion and the altogether too frequently diminished carbohydrate intake during labour may so deplete the glycogen stores that acidosis and alterations in the insulin requirement will ensue.

During the puerperium, there is usually a marked increase in sugar tolerance, and if care is not taken, hypoglycæmic attacks will complicate this period. In Case 34 previously mentioned, the insulin requirement gradually fell from 160 units per day at the time of delivery to 80 units per day three weeks after Cæsarean section.

It is frequently stated that even mild puerperal sepsis may precipitate acidosis and coma with great rapidity. Fortunately it can now be said that puerperal sepsis in any form appears to be a rare complication in diabetic pregnancies. In the series of cases presented at the end of this paper, there has been only one maternal death. The cause was puerperal sepsis. A brief history of this case is pertinent because it mentions some of the complications so common in the diabetic pregnancy.

Mrs. M.B. (Case 9), a *multipara*, aged twenty-seven years, first attended the Royal Hospital for Women in January, 1940, when approximately fourteen weeks pregnant. She gave a history of mitral stenosis and *diabetes mellitus* over the past thirteen years. In 1939, she had been confined of a stillborn infant weighing six and three-quarter pounds after premature labour commencing at the thirty-fourth week. The present pregnancy was uncomplicated by toxæmia or excessive weight gain and an insulin quota of 50 units per day adequately controlled the diabetes. At the thirty-fourth week of pregnancy, premature labour commenced, and after forty-eight hours, a breech delivery was satisfactorily concluded. Soon after her confinement, the patient's temperature rose and from then on the history was typically that of fulminating septicæmia. The organism isolated from the blood on several occasions was the group A hæmolytic streptococcus. Among the findings at autopsy was acute endocarditis. Neo-natal death of the infant occurred on the third day.

The fatal outcome was probably not influenced to any extent by the diabetes, for at this particular period an adequate chemotherapeutic barrage could not be launched against the invading organism.

The Increased Tendency to Ketosis.

It is an established fact that acetonuria is of frequent occurrence during pregnancy. Probably over 30% of pregnant women show evidence of this phenomenon at some period. Like renal glycosuria, it is found most frequently in the sixth and seventh months. It is also common near term. Almost invariably a rapid disappearance is noted during the puerperium. The increased tendency to ketosis is thought to be due to two main factors: (*a*) during pregnancy the diminished carbon dioxide combining power of the blood renders the pregnant patient less resistant to acidosis; (*b*) the elevated basal metabolic rate in pregnancy increases the tendency to acidosis.

Water Retention.

Water retention is one of the most outstanding features of pregnancy in the diabetic. This is shown by an abnormal gain in weight, œdema, hydramnios, hydræmia and fœtal œdema. White and Hunt state that evidence of water retention is found in 85% of cases.

In the last 14 cases in the present series, a disturbance of water balance was present in 12. In most instances, this feature could be demonstrated in both mother and baby.

Imbalance of the Sex Hormones.

The importance of imbalance of the sex hormones was first stressed by Priscilla White and her associates at the Boston Clinic. It will be remembered that the hormones of pregnancy are three: (i) chorionic gonadotropin (prolan), (ii) œstrin, and (iii) progesterone.

In most normal non-diabetic patients the following pertains. Chorionic gonadotropin is believed to be elaborated by the placenta. The level of chorionic gonadotropin in the blood normally commences to rise on the thirty-fifth day after the last menstrual period. It reaches a maximum between the fiftieth and seventy-fifth days and then falls abruptly to normal at about the hundredth day. A secondary rise occurs just prior to term. During early pregnancy, the source of œstrin and progesterone is the ovary. In later pregnancy, the placenta apparently takes over the production. A marked rise in the

levels of œstrin and progesterone begins on the hundredth day. These levels continue to rise, and near term the level of œstrin in the blood may reach 50 rat units or even more. Pregnandiol, the excretion product of progesterone, is found in the urine in amounts often exceeding 50 milligrammes daily.

In diabetic pregnancies, it is said that in approximately 80% of cases there is an imbalance between these three hormones. This derangement is manifested by the following: (i) low excretion of pregnandiol due to low serum level of progesterone; (ii) low serum level of œstrin; (iii) high serum level of chorionic gonadotropin.

Frequent clinical signs which one finds associated with the above are those which were formerly thought typical of diabetic pregnancies, namely, excessive gain in weight, œdema, hypertension, albuminuria, hydramnios and either intrauterine death or early neonatal death of the fœtus following premature delivery. The excessive size of the infant, which in many cases is quite outstanding, is also believed to be due to a high serum level of chorionic gonadotropin. This feature, incidentally, was one believed to be due to hyperglycæmia.

Complications of Pregnancy in the Diabetic.

At this stage it may well be asked what complications of pregnancy we may expect in the case of the pregnant diabetic. In brief, the effects of diabetes on pregnancy not infrequently result in the following proven complications:

1. The incidence of abortions and premature labour is greatly augmented. In view of recent work, this is apparently closely linked with disarranged endocrine function. In the series of

TABLE I.

Year.	Total Number of Confinements.	Number of Diabetics.	Maternal Deaths.	Infants Surviving.
1935 ..	2,043	2	—	2
1936 ..	2,346	1	—	1
1937 ..	2,481	Nil	—	—
1938 ..	3,003	2	—	2
1939 ..	3,096	2	—	2
1940 ..	3,130	2	1	Nil
1941 ..	2,995	2	—	2
1942 ..	2,601	2	—	2
1943 ..	3,018	3	—	Nil
1944 ..	2,565	2	—	2
1945 ..	2,599	4	—	2
1946 ..	2,846	4	—	2
1947 ..	2,899	14	—	9
1948 ..	2,989	5	—	4
Total ..	38,611	45	1	30

44 cases presented in this paper, there is a history of 22 spontaneous abortions and two therapeutic abortions. Premature labour also figures prominently in the series, although its advent has possibly been circumvented in some of the more recent cases by deliberate surgical induction or Cæsarean section at the thirty-eighth week.

2. Toxæmia of pregnancy is certainly more frequent. It occurred in 20 cases of the present series. According to Smith and Smith, an excess of serum chorionic gonadotropin precedes and predicts the onset of toxæmia by about six weeks. The following case is of interest.

Mrs. M.B. (Case 27), a *multipara*, aged thirty years, first attended the Royal Hospital for Women in June, 1946, when approximately twelve weeks pregnant. It was her fifth pregnancy. Her fourth pregnancy in 1944 had been complicated by eclampsia. Diabetes was known to have been present for five years. The preliminary examination at the out-patient department revealed no great abnormality. Her blood group was O (IV) Rh-positive. She was permitted to continue with a 1700 Calorie diet and 10 units of protamine zinc insulin daily. All went uneventfully until the twenty-eighth week. At the latter period, an excessive gain in weight was noted. This was soon followed by a rise in blood pressure. Admission to hospital was advised. The blood pressure remained at a fairly constant level, approximately 145 millimetres of mercury, systolic, and 100 millimetres, diastolic, for the remainder of the pregnancy. The insulin dosage remained adequate. At the thirty-eighth week a Cæsarean section was performed and a living male baby weighing eight pounds twelve ounces was delivered. It was œdematous and showed evidence of mild jaundice for the first week. Its blood sugar content immediately after delivery was 80 milligrammes *per centum*. In order to combat the development of possible hypoglycæmia, five millilitres of 10% dextrose solution were given intramuscularly into each buttock. Apart from an excessive weight loss during the first forty-eight hours, the child occasioned no worry. The puerperium, apart from unsatisfactory lactation, was uneventful.

3. Death *in utero* during the last few weeks of pregnancy is unfortunately common. This occurred in 10 cases of the present series. The reason for this complication is still in doubt. Formerly hyperglycæmia or hypoglycæmia and ketosis were believed responsible. Placental glycopenia is also an interesting possibility. The latter condition, of course, would be most likely to occur in cases in which there is inadequate control of the diabetes. Lawrence and Oakley still maintain that good control of the diabetes favours successful outcome of diabetic pregnancies. Many, however, including the members of the Boston Clinic, believe that hyperprolanæmia plays a major role in this disaster. The usual sequence of events is depicted in the following case.

Mrs. D.S. (Case 37), a *primipara*, aged thirty-five years, was referred to the Royal Hospital for Women in October, 1947, because of death of the fœtus *in utero*. Little was known of her antenatal supervision. On admission to hospital, she stated that movements had ceased the week previously, that is at the thirty-seventh week. On examination of the patient, her systolic blood pressure was 160 millimetres of mercury and the diastolic 110 millimetres. The urine contained a cloud of albumin and "three pluses" of sugar. The result of abdominal examination was indefinite, as the patient was very obese. X-ray examination revealed positive signs of fœtal death. A breech presented. At this stage the patient was at the thirty-eighth week. A glucose tolerance test yielded a typical diabetic curve. A 1500 Calorie diet was advised and the sugar content of the urine diminished. After a medical induction, labour commenced and a macerated fœtus weighing five pounds six ounces was delivered. The puerperium was uneventful. It is almost certain that diet will control this patient's diabetic condition for at least some time.

4. Excessive weight is said to be a very constant feature in babies of diabetic mothers. In the series presented, this has been noted in only five cases. Only three of the babies weighed over 12 pounds. The maximum weight recorded in the series was 13 pounds two and a half ounces. According to most observers, overweight is found in 80% of cases. The weight is influenced by fat, œdema and splanchnomegaly. In regard to the last mentioned, it has been shown that the liver, spleen and heart are mainly affected. It is less evident in lungs and kidneys. The brain is said to be consistently smaller than normal. Microscopic examination of the various organs is also of interest. The liver and spleen frequently have areas of hæmatopoiesis, while hyperplasia of the islet tissue of the pancreas has, for a long time, been regarded as of possible significance. It is thought that this hyperplasia, first described by Anderodias and Dubreuil in 1920, is due to a high fœtal blood sugar content and the consequent greater call for insulin.

TABLE II.

Incidence of the Commoner Complications Encountered in the Present Series of 45 Cases.

Complications.	Number of Cases.	Incidence.
Pre-eclampsia	20	44·5%
Hydramnios	5	11·1%
Past history of abortions	10	22·2%
Premature labour (excluding inducton)	6	13·3%
Induction before viability of fœtus	3	6·6%
Death of fœtus *in utero*	10	22·2%
Neo-natal death of infant	4	8·8%
Birth weight of infant of over 10 pounds	5	11·1%
Breech presentation	4	8·8%
Occipito-posterior position	5	11·1%
Transverse presentation	1	2·2%
Multiple pregnancy	2	4·4%
Fœtal abnormalities	2	4·4%

5. Congenital malformations are more frequent. Early this year at the Royal Hospital for Women a severely diabetic woman gave birth to a grossly deformed infant. Hare-lip, cleft palate and gross deformities of all limbs were present. In view of the possibility of fœtal deformity, it is always essential to have the fœtus examined radiologically before one embarks on a surgical procedure such as Cæsarean section. Case 30 provides a good example of this complication.

6. Hydramnios is more common. It is said that the increased sugar content of the *liquor amnii* stimulates the amniotic epithelium to secrete excessive fluid. Whilst, however, the origin of amniotic fluid in general is in doubt, such a statement must be accepted with reserve. Since the discovery of insulin, the frequency of hydramnios has fallen, and if present at all, it is now usually of a moderate variety. Four cases are mentioned in this series (see Table II).

7. Lactation is usually inhibited quite early in the puerperium. The diabetic who can breast feed her baby is the exception rather than the rule. It is believed that this highly undesirable feature is due to either relative undernutrition or lack of the specific lactogenic hormone.

8. Neonatal death of the fœtus is also an unpredictable hazard. The possibility of anoxæmia and instability of the blood sugar level is ever present. Atelectasis is a common post-mortem finding in these cases. Neonatal death occurred in four cases of the present series.

9. The placenta is usually large and the cord not infrequently of greater diameter than normal. Placental infarcts are said to be common, but have not been noted in the present series.

10. Shoulder dystocia, due to the increased biacromial diameters of these large babies, often presents a problem during delivery. Two cases have occurred. In one, in which the biacromial diameter was five and a half inches, death of the fœtus during delivery occurred (Case 36).

The Modern Management of the Diabetic Pregnancy.

In this section, a brief survey of the treatment as described by Priscilla White and her associates at the New Deaconess Hospital, Boston, will be given.

Management of the diabetic state during pregnancy should not prove excessively difficult. The lowered renal threshold and the tendency to ketosis are the most likely causes of confusion.

The Diet.

The diet must be adequate. The caloric requirement is determined by the weight of the patient; generally speaking, 30 Calories per kilogram of body weight are desirable. The carbohydrate quota should be liberal; usually 200 grammes per day are permissible. It is important to adjust protein intake to a higher level, that is, two grammes per kilogram of body weight. Fat is then added in amounts required to complete the caloric requirements. Sodium chloride should be restricted and sodium bicarbonate in any form prohibited. It will be remembered that, even in normal pregnancy, the patient has difficulty in dealing with the sodium ion. If there is any evidence of œdema, 60 to 120 grains of ammonium chloride should be given daily. It is usually advisable to supplement the diet by an adequate vitamin preparation. Vitamins *A*, *B*, *C*, *D* and *K* are usually recommended. "Panoplex", a Wyeth preparation, is suitable if given in the dosage of one capsule daily. Mineral deficiency should also be carefully guarded against. The latter risk can be obviated by prescribing an iron preparation, such as *Pilula Ferri Sulphatis* or "Feromax", throughout the course of pregnancy. Likewise, a calcium preparation may be given intermittently if deemed necessary.

Insulin.

Insulin is prescribed according to blood sugar levels, rather than to urine sugar content. With the lowered renal threshold previously mentioned, careless administration of insulin until the urine is "sugar free" may well result in hypoglycæmia. If facilities are unavailable to ascertain serial fasting and non-fasting blood sugar levels, it is better to err on the side of allowing the urine to contain small quantities of sugar. During normal delivery, the patient should receive adequate carbohydrate. Failure to observe this rule may well result in hypoglycæmic attacks at this period. As shown previously, the insulin requirements usually increase with each trimester. A fairly rapid fall in the insulin quota may be anticipated after delivery.

Hormone Imbalance.

If the diabetes is of a severe grade, and particularly if it has been of long standing, hormonal imbalance may be rightly suspected. Confirmatory evidence, such as clinical signs of hypogonadism, may be present. Symptoms such as menorrhagia, periods of amenorrhœa, chronic cystic mastitis and œdema, may have been present prior to the advent of pregnancy. In order to determine whether or not substitutional hormonal therapy is warranted, weekly determination of the amount of pregnandiol in the urine (over a twenty-four-hour period) and of the level of chorionic gonadotropin in the serum, and vaginal smears to determine the approximate œstrin level of the blood are necessary. If abnormalities in distribution of the above are found, parenteral hormonal therapy should be commenced. A scheme which may be followed is set out in Table III. "Proluton", a proprietary preparation of progesterone, and stilbœstrol, a synthetic œstrogen, are used. If nausea, vomiting or giddiness is precipitated by the stilbœstrol, diencestrol may be substituted, the dosage of the latter being approximately one-third that recommended for stilbœstrol. The dose is given either daily or every other day.

Complications which have occurred as a result of this intensive therapy are rare. The commonest appear to be urticaria and, rarely, later endometrial hyperplasia. Fortunately, there has been no evidence whatsoever of carcinogenesis in any of the published series.

In Australia few laboratories are equipped to perform weekly serum gonadotropin and urinary pregnandiol estimations. However, examination of vaginal smears is of some assistance. The smears are taken according to the technique described by Papanicolaou and Traut. At the Royal Hospital for Women a single differential stain devised by Ephraim Shorr is used. On examination of a suitably stained smear, three types of cells will be recognized, the basal, precornified and cornified cells. Assessment of endocrinal imbalance is made after estimation of the relative proportions of these cells.

TABLE III.

Week of Pregnancy.	"Proluton" in Milligrammes.	Stilbœstrol in Milligrammes.
20	5	5
20 to 24 ..	10	10
24 to 28 ..	15	15
28 to 32 ..	20	20
32 to 36 ..	20	25
36 to term ..	15 to 50	30 to 50

Method of Delivery.

There are two widely divergent schools of thought on the method of delivery; one favours natural delivery, the other, led by Paul Titus, favours Cæsarean section. In many leading North American clinics the following routine is adhered to.

1. If the patient is a *multipara* and has had diabetes for only a short time, and the course of pregnancy has been uneventful as shown by hormonal assays *et cetera*, natural delivery following induction at the thirty-seventh to thirty-eighth week is permitted.

2. Patients who do not fall into the above group are subjected to Cæsarean section at either the end of the thirty-seventh or the beginning of the thirty-eighth week.

At the Royal Hospital for Women, patients who fall into the first category mentioned above undergo surgical induction if the cervix is favourable, by artificial rupture of the membranes, followed by administration of "Pitocin", either at the end of the thirty-seventh week or during the thirty-eighth week. Cæsarean section has, to date, been resorted to in selected cases.

In all, seven patients have been subjected to Cæsarean section in the present series. Five of the operations were performed during the preceding eighteen months. The outcome has been eminently gratifying. No maternal complications of a severe nature were encountered. Six babies survived; the one that died did so sixteen hours after delivery and it was grossly deformed. Unfortunately, the deformities in this case were of a nature which it was not possible to determine by radiological examination (Case 30).

If Cæsarean section has been decided upon, certain rules prior to operation must be followed. Firstly, no premedication apart from atropine is justified. Anoxæmia is a dangerous hazard for the baby under the best of circumstances. A dulling of its respiratory centre to stimuli, as would obtain if premedicants were given, could quite easily result in disaster. Prior to operation, the intravenous administration of 1000 millilitres of 5% dextrose solution is recommended.

The Anæsthetic.

There is again some diversity of opinion regarding the anæsthesia. At the Boston Clinic, spinal anæsthesia is favoured. Their results appear to be excellent. We should remember, however, that the mortality following the use of spinal anæsthesia in obstetrics exceeds that of any other type of anæsthesia. McIntosh Marshall states that one must be prepared to accept a mortality of 1% directly attributable to the anæsthetic, if spinal anæsthesia is used for Cæsarean section. Local anæsthesia

TABLE IV.

A Survey of All Diabetics Who have Attended the Obstetrical Department of the Royal Hospital for Women during the Years 1935–1948 Inclusive.

Case Number.	Name of Patient.	Age. (Years.)	Number of Pregnancy.	Abortions.	Daily Insulin Requirements. (Units.)	Diet. Caloric Value	Year of Confinement.	Supervision During Pregnancy.	Maximum Ketosis.	Maximum Glycosuria.	Hydramnios.	Toxæmia.	Presentation of Fœtus.	Induction.	Duration of Labour.	Method of Delivery.	Period of Gestation. (Weeks.)	Death in *Utero*.	Neo-Natal Death.	Birth Weight of Baby.	Fœtal Abnormality.
															h. m.					lb. oz.	
1	G.B. ..	29	2nd.	Nil.	15	Unknown.	1935	Yes.	Trace.	++	Nil.	Nil.	R.O.P.	—	2 5	Normal.	36	No.	No.	9 1	Nil.
2	R.O'N. ..	33	1st.	Nil.	Nil.	Unknown.	1935	Nil.	+	++	Nil.	Nil.	L.O.A.	—	15 20	Normal.	40	No.	No.	8 8	Nil.
3	B.D. ..	26	3rd.	Nil.	Nil.	Unknown.	1936	Nil.	+	+	Nil.	Nil.	L.O.A.	—	5 5	Normal.	40	No.	No.	8 5	Nil.
4	P.T. ..	34	4th.	Nil.	70	1500	1938	Yes.	Trace.	++	Nil.	Nil.	R.O.A.	—	6 35	Normal.	40	No.	No.	7 8	Nil.
5	K.A. ..	21	3rd.	2	Nil.	Unknown.	1938	Nil.	Nil.	+	Nil.	Nil.	R.O.P.	—	8 0	Normal.	40	No.	No.	7 7½	Nil.
6	M.B. ..	26	1st.	Nil.	80	Unknown.	1939	Yes.	Nil.	++	Nil.	Nil.	L.O.A.	Medical.	7 40	Normal.	40	Yes.	—	6 4	Nil.
7	M.McM. ..	37	10th.	2	Nil.	Unknown.	1939	Yes.	Trace.	+++	Nil.	Nil.	Twins.	—	4 50	Normal.	39	No.	No.	7 4	Nil.
																				5 13	
8	D.C. ..	43	14th.	8	Nil.	Unknown.	1940	Nil.	Nil.	+	Nil.	Yes.	Transverse.	—	9 10	Version. 36 weeks.	—	No.	Yes.	4 11	Nil.
9	M.B. ..	27	2nd.	Nil.	50	Unknown.	1940	Yes.	++++	++++	Nil.	Nil.	L.S.A.	—	48 0	Breech.	34	No.	Yes.	5 2	Nil.
10	A.M. ..	20	1st.	Nil.	100	1500	1941	Nil.	+	++++	Nil.	Nil.	R.O.A.	Yes.	19 45	Normal.	38	No.	No.	6 1	Nil.
11	M.P. ..	26	2nd.	Nil.	25	1300	1941	Yes.	Nil.	++	Nil.	Yes.	R.O.A.	—	5 10	Normal.	40	No.	No.	9 2	Nil.
12	B.I. ..	24	2nd.	—	—	—	1942	—	+	++++	Nil.			Induction at fourth month because of uncontrollable diabetes.							
13	E.H. ..	26	2nd.	Nil.	70	1900	1942	Yes.	++	++++	Nil.	Nil.	R.O.A.	—	—	Cæsarean.	36	No.	No.	6 5	Nil.
14	V.P. ..	43	2nd.	Nil.	Nil.	Unknown.	1943	Nil.	Nil.	+	Nil.	Yes.	L.O.P.	—	3 45	Normal.	40	Yes.	—	8 13	Nil.
15	V.J. ..	27	2nd.	Nil.	40	1700	1943	Nil.	+	+++	Nil.	Nil.	L.O.A.	—	21 0	Normal.	34	Yes.	—	4 4	Nil.
16	B.I. ..	25	3rd.	1	90	1700	1943	Yes.	++++	++++	Nil.	Nil.	L.O.A.	Yes.	4 45	Normal.	32	Yes.	—	3 4	Nil.
17	D.B. ..	26	1st.	Nil.	Nil.	1900	1944	Yes.	Nil.	++	Nil.	Yes.	L.S.A.	—	14 20	Breech.	40	No.	No.	7 1	Nil.
18	V.B. ..	38	3rd.	Nil.	60	Unknown.	1944	Yes.	Nil.	+++	Nil.	Yes.	R.O.A.	Yes.	5 25	Normal.	38	No.	No.	5 10	Nil.
19	M.C. ..	23	1st.	Nil.	20	Unknown.	1945	Yes.	+	+++	Nil.	Nil.	L.O.A.	—	—	Cæsarean.	38	No.	No.	7 10	Nil.
20	V.S. ..	29	3rd.	1	20	Unknown.	1945	Yes.	+	+++	Nil.	Yes.	L.O.A.	No.	10 55	Normal.	36	Yes.	—	4 11	Nil.
21	T.G. ..	34	2nd.	1	40	1900	1945	Nil.	++	+++	Nil.	Nil.	L.O.A.	Yes.	13 45	Normal.	38	Yes.	—	10 0	Nil.
22	J.S. ..	19	1st.	Nil.	Nil.	Unknown.	1945	Yes.	Nil.	+	Nil.	Nil.	R.O.A.	No.	7 0	Normal.	39	No.	No.	7 0	Nil.
23	M.C. ..	37	4th.	1	Nil.	1700	1946	Nil.	Nil.	++	Nil.	Yes.	L.O.A.	Yes.	15 45	Normal.	38	No.	No.	7 14	Nil.
24	L.C. ..	31	3rd.	Nil.	20	1700	1946	Nil.	Nil.	+++	Yes.	Yes.	L.O.A.	Yes.	11 0	Normal.	40	—	Yes.	7 8	Yes.
25	E.G. ..	37	8th.	3	25	1700	1946	—	Nil.	++	Yes.			Induction at fourth month because of severe hypertension and myocardial degeneration							
26	E.L. ..	28	1st.	Nil.	10	2000	1946	Yes.	+	+++	Nil.	Nil.	R.O.A.	Yes.	24 45	Normal.	38	No.	No.	6 14	Nil.
27	M.B. ..	30	4th.	Nil.	10	1700	1947	Yes.	Nil.	+++	Nil.	Yes.	L.O.A.	—	—	Cæsarean.	38	No.	No.	8 12	Nil.
28	G.F. ..	34	1st.	Nil.	22	1900	1947	Yes.	+	+++	Yes.	Nil.	R.O.A.	—	—	Cæsarean.	38	No.	No.	8 14	Nil.
29	E.R. ..	30	1st.	Nil.	Nil.	1700	1947	Yes.	Nil.	++	Yes.	Yes.	L.O.A.	No.	16 45	Normal.	39	No.	No.	8 0	Nil.
30	J.D. ..	30	1st.	Nil.	64	1800	1947	Nil.	+	++++	Nil.	Nil.	L.S.A.	—	—	Cæsarean.	39	No.	Yes.	6 0	Yes.
31	V.S. ..	34	2nd.	Nil.	Nil.	1000	1947	Yes.	+	+	Nil.	Yes.	L.O.A.	No.	1 40	Normal.	39	No.	No.	10 1	Nil.
32	L.C. ..	32	4th	Nil.	Nil.	1500	1947	Yes.	Nil.	+	Yes.	Nil.	Twins.	No.	6 0	Normal.	38	No.	No.	6 14	Nil.
																				6 6	
33	V.B. ..	25	4th.	Nil.	Nil.	Doubtful.	1947	Nil.	+	++++	Nil.	Nil.	L.O.A.	No.	11 0	Normal.	40	Yes.	—	7 11	Nil.
34	W.B. ..	41	5th.	Nil.	170	2000	1947	Yes.	+++	++++	Nil.	Nil.	R.O.P.	—	—	Cæsarean.	38	No.	No.	7 0	Nil.
35	R.D. ..	40	14th.	3	Nil.	Unknown.	1947	Nil.	+	+	Nil.	Nil.	L.O.P.	No.	13 15	Impacted shoulders.	40	No.	No.	12 12	Nil.
36	J.C. ..	25	1st.	Nil.	Nil.	Unknown.	1947	Nil.	Nil.	+	Nil.	Nil.	R.O.A.	No.	5 50	Impacted shoulders.	40	Yes.	—	12 6	Nil.
37	D.S. ..	35	1st.	Nil.	Nil.	1500	1947	Nil.	+	++++	Nil.	Yes.	L.S.A.	Yes.	8 0	Breech.	38	Yes.	—	5 6	Nil.
38	E.G. ..	38	9th.	—	—	—	1947	—	Nil.	++	Nil.	Yes.	Hysterotomy and sterilization at third month because of severe hypertension and myocardial degeneration.								
39	C.J. ..	31	2nd.	Nil.	Nil.	2000	1947	Nl.	Nil.	+	Nil.	Yes.	R.O.A.	Yes.	6 30	Normal.	38	No.	No.	7 11	Nil.
40	D.B. ..	29	2nd.	Nil.	Nil.	1900	1947	Yes.	Nil.	+	Nil.	Yes.	R.O.A.	Yes.	5 20	Normal.	38	No.	No.	6 0	Nil.
41	E.S. ..	27	4th.	Nil.	Nil.	1800	1948	Yes.	Nil.	+	Nil.	Yes.	L.O.A.	No.	3 50	Normal.	38	No.	No.	9 4	Nil.
42	E.L. ..	29	2nd.	Nil.	Nil.	1800	1948	Yes.	+	+++	Nil.	Yes.	R.O.A.	Yes.	1 40	Normal.	38	No.	No	6 10	Nil.
43	B.F. ..	23	1st.	Nil.	Nil.	1800	1948	Yes.	Trace.	++++	Nil.	Yes.	R.O.A.	Yes.	6 55	Normal.	38	No.	No.	7 3½	Nil.
44	N.H. ..	25	1st.	Nil.	68	2800	1948	Yes.	Trace.	++++	Yes.	Nil.	R.O.P.	—	—	Cæsarean.	38	No.	No.	6 8	Nil.
45	D.H. ..	22	2nd.	1	Nil.	2000	1948	Nil.	Nil.	+++	Nil.	Yes.	L.O.A.	Yes.	6 0	Normal.	40	Yes.	—	13 2½	Nil.

[1] R.O.A. = Right occipito-anterior. R.O.P. = Right occipito-posterior. L.O.A. = Left occipito-anterior. L.O.P. = Left occipito-posterior. L.S.A. = Left sacro-anterior.

would appear to be a logical choice. Ether and gaseous anæsthetics which predispose to post-operative vomiting must be vigorously eschewed for very obvious reasons.

Post-Operative Care.

After operation, the insulin needs are adjusted in accordance with blood sugar determination and urine tests. Several hours after operation, another litre of 5% dextrose solution is given. Similar treatment is carried out twice daily for the ensuing three days. Carbohydrate administration in amounts up to 100 grammes daily is also permitted by mouth; glucose in water, flavoured with either orange or lemon juice, admirably fulfils this requirement. After this, that is, on the fourth post-operative day, there is a gradual build-up to the pre-operative dietary level.

Management of the Infant.

Care of the newborn infant is of the utmost importance. Respiratory difficulties prove to be the most troublesome feature. The air passages must be sucked free of fluid and mucus. Suitable posture is essential. It is an established fact that the bronchial tree of these babies contains a superabundance of amniotic fluid. There are two possible explanations for this. Firstly, it has been shown that if sugar is introduced into the amniotic sac, the fœtus will be induced to swallow. The amniotic fluid of the diabetic frequently contains excessive sugar, hence this mechanism may be precipitated. Secondly, the uterus of the diabetic is said to be very irritable and contractions are frequent. As a result of the frequently changing intrauterine pressure, the fœtus may be induced to swallow. Oxygen must be given intranasally from the outset. Œdema, which, as formerly mentioned, is a characteristic feature, is combated by purposeful dehydration; usually a restricted fluid intake for the first three to five days should suffice. If the occasion should arise, adrenaline and α-lobeline may be used as respiratory stimulants. Jaundice, which is very common, justifies no anxiety, for it is almost invariably associated with a normal blood count.

It was formerly thought advisable to give glucose to the infant immediately after delivery in order to combat possible hypoglycæmia. Usually, five millilitres of 10% dextrose solution were given intramuscularly into each buttock. Up to June, 1947, this had been the routine at the Royal Hospital for Women. It now appears that such treatment is unnecessary. In a series of blood sugar estimations made at the Royal Hospital for Women from normal babies within one hour of birth blood sugar levels as low as 40 milligrammes *per centum* were frequently found. Such babies manifest none of the characteristic signs of hypoglycæmia. The lowest blood sugar reading from the baby of a diabetic mother to date has been 50 milligrammes *per centum* (Case 34).

Conclusion.

It will readily be seen from the above that treatment of the pregnant diabetic has been largely revolutionized by hormone substitutional therapy. If the latter is carried out adequately it would appear that the complications which were formerly so common may be reduced to an almost negligible level. At the New Deaconess Hospital, Boston, the results of such therapy demand attention. In a series of cases in which an abnormal hormonal pattern was detected and corrected by substitutional therapy, a fœtal survival rate of 90% and a pre-eclamptic incidence of 5% were obtained. In a controlled group with a similar derangement of hormones, in which no substitutional therapy was resorted to, the fœtal mortality rose to 44% and the incidence of pre-eclampsia ranged round 50%.

In the present series of cases at the Royal Hospital for Women, there has only recently been opportunity to attempt substitutional therapy. At present every endeavour is made to control the diabetes meticulously, to give progesterone and stilbœstrol when necessary, and either to induce labour or to perform Cæsarean section at the thirty-eighth week.

It must be stressed that the fœtal survival rate in the present series does not represent the fœtal survival rate in a controlled and carefully supervised group of diabetic pregnancies. In many instances the patients were referred to the Royal Hospital for Women as emergency patients because of the onset of some grave complication such as pre-eclampsia or death *in utero*. The latter complication, for example, was responsible for the patients' transfer to this hospital in three instances during the years 1947 and 1948. Notwithstanding all such complications, 28 of the pregnancies terminated successfully, that is, nearly two-thirds of all patients treated left hospital with a living baby.

The incidence is given of *diabetes mellitus* among all the patients attending each year over the period of the survey (Table I).

In Table II the indicence is outlined of the various complications found not infrequently in diabetic pregnancy.

A comprehensive survey of all individual patients is given to conclude the paper (Table IV).

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I am indebted to the members of the honorary medical staff of the Royal Hospital for Women, Paddington, for permission to publish this paper, and in particular to Dr. J. Kempson Maddox, honorary physician for the hospital, for much advice and encouragement.

Bibliography.

Eastman, N. J. (1946), "Diabetes Mellitus and Pregnancy", *Obstetrical and Gynecological Survey*, Volume I, page 3.
Herzstein J., and Dolger, H. (1946), "The Fœtal Mortality of Women during the Pre-diabetic Period", *American Journal of Obstetrics and Gynecology*, Volume LI, page 420.
Hurwitz, D., and Irving, F. C. (1937), "Diabetes and Pregnancy", *The American Journal of the Medical Sciences*, Volume CXXIV, page 85.
Joslin, E. P., *et alii* (1946), "Treatment of Diabetes Mellitus".
Miller, H. C., Hurwitz, D., and Kuder, K. (1944), "Fœtal and Neonatal Mortality in Pregnancies Complicated by Diabetes Mellitus", *The Journal of the American Medical Association*, Volume CXXIV, page 271.
Short, E. (1945), "An Evaluation of the Clinical Applications of the Vaginal Smear Method", *The Journal of the Mount Sinai Hospital*, Volume XII, page 667.
White, P., Titus, R. S., Joslin, E. P., and Hunt, H. (1939), "The Prediction and Prevention of Late Pregnancy Accidents in Diabetes", *The American Journal of the Medical Sciences*, Volume CXCVIII, page 482.
Lambie, C. G. (1926), "Diabetes and Pregnancy", *The Journal of Obstetrics and Gynæcology of the British Empire*, Volume XXXIII, page 563.
White, Patricia (1943), "Infants of Diabetic Mothers", *Virginia Medical Monthly*, Volume LXX, page 436.
Jordon, W. R. (1943), "Pregnancy and Diabetes", *Virginia Medical Monthly*, Volume LXX, page 441.
Wilson, R. B. (1945), "Pregnancy and Diabetes", *The Medical Clinics of North America*, Volume XXIX, page 1477.
White, P. (1947), "Pregnancy Complicating Diabetes of More than 20 Years' Duration", *The Medical Clinics of North America*, Volume XXXI, page 395.

DIABETES IN PREGNANCY: LABORATORY ASSISTANCE.

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The obstetrician is greatly dependent upon the clinical pathologist if his work is to be successfully accomplished when *diabetes mellitus* complicates pregnancy. Certain aspects of the problem must concern the pathologist, namely, (i) the diagnosis of diabetes in pregnancy, (ii) aid in the management of the diabetic mother, (iii) the state of the fœtus.

Diagnosis.

Glycosuria.

The pathologist is often consulted because of the appearance of reducing substances in the urine during pregnancy. This phenomenon is extremely common; in fact its occurrence after a large dose of carbohydrate was once used as a test for pregnancy. Sara Weiden from Melbourne reported glycosuria by Fehling's test in 6·9% of non-pregnant women and in up to 26·6% of pregnant women, the highest rate in the latter group occurring in the first trimester.

Recently Archer and Haram, using Benedict's test, found that 96% of a group of women excreted reducing substances in the urine at some time during their pregnancy (Table I).

This incidence appears to depend largely on the sensitivity of the test solution. Benedict's solution will be reduced by amounts of glucose which are normally present in the urine; thus, whilst it has certain advantages over Fehling's test, Benedict's test should yield some yellow deposit on standing before the amount of reducing substance in the urine is regarded as abnormal.

It is sometimes assumed that the reducing substance found in the urine during pregnancy is lactose. The differentiation of lactose from glucose has not been found easy at my hospital. Over a period of eight and a half months in late 1947 and early

1948 we performed fermentation tests on 114 urine specimens containing reducing substances, the great majority of which were submitted by pregnant women. Of these 114 specimens, 39 yielded a positive result to the fermentation test (indicating glucose) and 75 yielded a negative result.

We do not regard this as a true picture of the relative frequencies of glucose and lactose. Lately we have resorted to the osazone test, and this has given more satisfactory results; in some cases we have seen glucosazone crystals when the result of the fermentation test has been negative.

TABLE I.
Incidence of Reducing Substances in Urine.
(Archer and Haram, 1948.)

Series of Patients.	Number of Patients.	Number of Cases with Reducing Substance.	Number of Specimens.	Number of Specimens with Reducing Substance.
Antenatal	123	118 (96%)	777	501 (64%)
Control	503	54 (11%)	503	54 (11%)
Postnatal ..	97	89 (92%)	258	210 (81%)

The report by Archer and Haram of their method to detect lactose in the urine commands attention. They utilize a test devised by Fearon in 1942, in which lactose and maltose in solution, if alkalinized and heated with methylamine, yield a bright violet-carmine pigment. The test was applied to urine specimens yielding a positive result to Benedict's test. The incidence of lactosuria demonstrated by this reaction is most striking (Table II).

We have found the reaction satisfactory at the laboratory of the Royal Hospital for Women; however, it seems that the carbohydrate is very rapidly destroyed on boiling, and a false negative finding may result. More consistent results seem to occur when urine, alkali and methylamine solution are all placed in a tube together and boiled for not more than five or ten seconds.

It is now generally accepted that sugar appearing in the urine in pregnancy, except just prior to delivery, will not be lactose but glucose. In the majority of women the explanation of this glycosuria is thought to be the lowering of the renal threshold to glucose. Whereas in the non-pregnant state the threshold lies between 150 milligrammes *per centum* and 180 milligrammes *per centum*, in pregnancy it is commonly less and may be as low as 120 milligrammes *per centum*.

TABLE II
Incidence of Lactosuria.
(Archer and Haram, 1948.)

Series of Patients.	Number of Cases.	Number of Cases giving Methylamine Reaction Positive.	Number of Specimens.	Number of Specimens giving Methylamine Reaction Positive.
Antenatal	123	0	501	0
Postnatal ..	97	61 (63%)	197	112 (57%)

In some cases the glycosuria is due to a true decreased carbohydrate tolerance in pregnancy; thus some individuals manifest diabetes only when pregnant, and it is well known that in severe diabetes the insulin requirement increases as pregnancy advances.

Although glycosuria in pregnancy is so common, nevertheless it must be regarded as significant when more than a trace is present on repeated examinations, should there be family history, past history, symptoms or other signs of diabetes.

Carbohydrate Tolerance.

Glycosuria or other features in any case may make assessment of the carbohydrate tolerance desirable. The estimation of blood sugar levels following the ingestion of 50 grammes of dextrose dissolved in water appears to be the method most widely used during pregnancy; some clinics employ the Exton-Rose "two dose one hour" test and others give 100 grammes instead of 50 grammes of dextrose in the draught. It does not seem that the higher dose of dextrose yields any further information; further there is no doubt that these larger doses of sugar are nauseating to the pregnant woman and this may distort the tolerance curve.

The normal response to the dextrose tolerance test at the various stages of pregnancy does not appear to have been clearly defined. Most valuable reports have come from Hurwitz and Jensen of Boston—a small series of cases—and recently from Sara Weiden in this journal, but as yet there is no report of the carbohydrate tolerance of a large number of women examined at regular intervals during pregnancy, and at the same time a detailed account of the progress and outcome of each pregnancy. Until such work is done the picture remains incomplete; further it is felt that minor abnormalities of the tolerance curve sometimes may be manifestations of a general hormonal upset which prevents a successful outcome of the pregnancy.

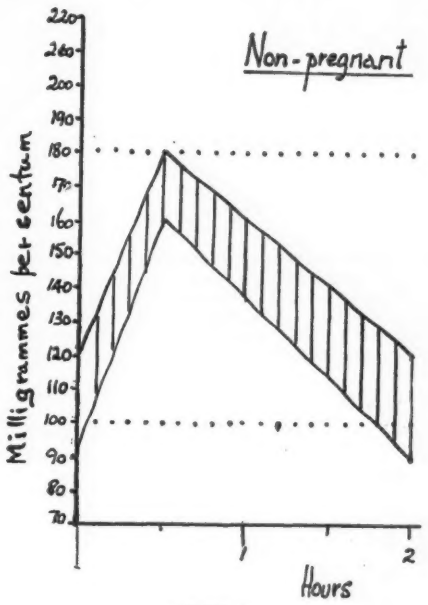

FIGURE I.

However, from the evidence available, it appears that the dextrose tolerance curve of normal pregnancy shows certain alterations from that of the non-pregnant state. Briefly these are lowering of the fasting blood sugar level, lowering of the maximum blood sugar value and delay in the fall of the curve.

Lowering of the Fasting Blood Sugar Level.—In non-pregnant persons the fasting blood sugar level normally lies between 80 and 120 milligrammes *per centum*. During pregnancy the majority of women will give a figure between 70 and 100 milligrammes *per centum*. As in non-pregnant individuals, the fasting blood sugar level may be influenced by exercise (being raised when this is moderate), by excitement or by apprehension.

Lowering of the Maximum Blood Sugar Value.—Lowering of the maximum blood sugar value is most marked in the third trimester of pregnancy. From a maximum of 160 to 180 milligrammes *per centum* in the non-pregnant state, the value tends to fall to between 140 and 160 milligrammes *per centum* in pregnancy.

Delay in the Fall of the Curve.—The curve falls more slowly so that the two-hour level is often higher than 100 to 110 milligrammes *per centum*, which is the maximum two-hour figure acceptable in a non-pregnant person; normally in pregnancy it will fall to 100 milligrammes *per centum* or less within three hours. For this reason Hurwitz and Jensen advocate that the test should continue for three hours, and our own experience is in accord.

For the purpose of comparison, the approximate normal ranges of the dextrose tolerance curves from tests on non-pregnant and pregnant individuals are diagrammatically represented in Figures I and II.

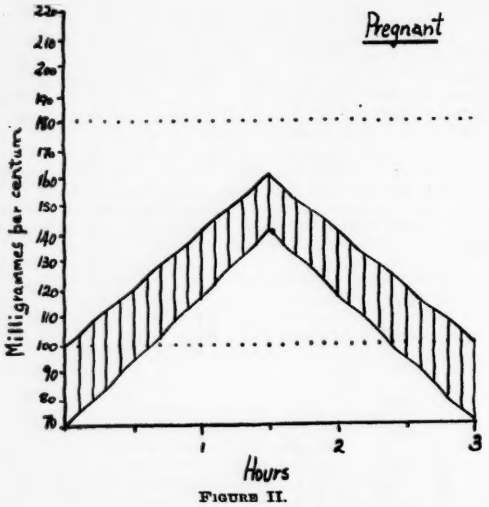

FIGURE II.

If the patient becomes nauseated—and this is quite likely in the early months—there may be delayed absorption of glucose, which is thought to be due to cessation of peristaltic movements and delay in emptying of the stomach. We have seen the curve shown in Figure III produced by tests on a patient who was severely nauseated.

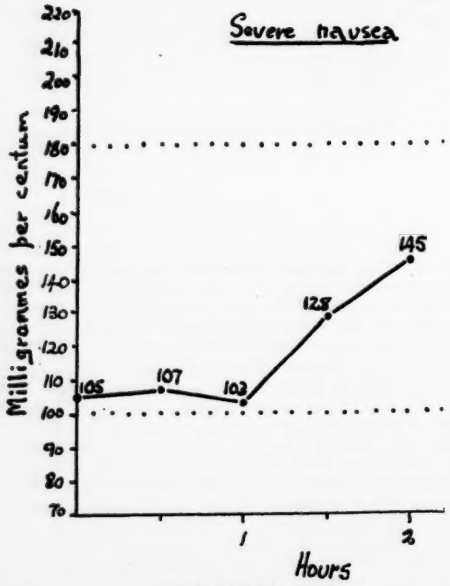

FIGURE III.

When an abnormal result is obtained, consideration must be given to the state of nutrition of the patient; it is well known that if the diet is restricted for more than a few days, tests on a normal individual may produce a diabetic type of curve. It must be remembered that *hyperemesis gravidarum* may alter the nutrition so that diabetes is simulated. We were recently afforded an excellent example of this.

The patient, J.R., aged twenty-four years, when three months pregnant was found to have glycosuria. She suffered from *hyperemesis gravidarum* and had lost one stone in weight, then weighing six stone five pounds. The result of the dextrose tolerance test made during the period of hyperemesis is shown in Figure IV, and the results of those made one month later, four months later, and *post partum* (seven months later) are shown in Figure V. In view of the fact that true diabetes never lessens as pregnancy advances, but tends to become more severe, it was considered that this patient was probably not diabetic. The patient was delivered of a normal infant after mild pre-eclampsia.

Dextrose tolerance tests in pregnancy may yield (i) a normal curve with or without renal glycosuria, (ii) a diabetic curve, or (iii) a group of curves which are considered to indicate disordered carbohydrate metabolism of pregnancy.

The Normal Curve.

Certain general features of the normal dextrose tolerance curve in pregnancy have already been outlined, but more rigid criteria are desirable for correct classification.

1. The fasting blood sugar level should be 100 milligrammes *per centum* or less. As stated earlier, this level may be altered by various physical and emotional factors.

2. The maximum blood sugar level will not exceed 160 milligrammes *per centum* usually. This feature of the curve is not of great importance.

3. The curve should fall to a level of 100 milligrammes *per centum* or less within three hours.

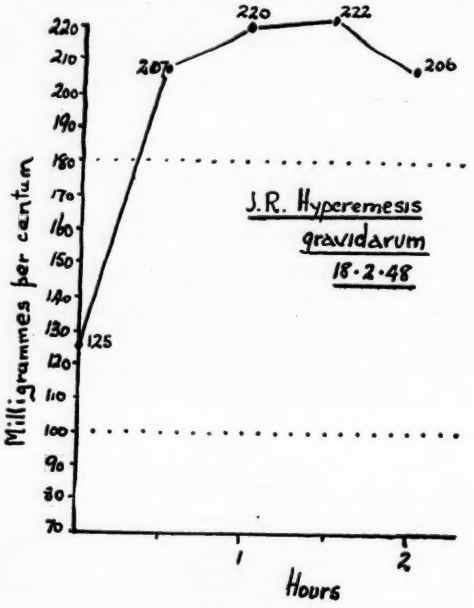

FIGURE IV.

The Diabetic Curve.

The diabetic patient presents no great difficulties since all the above three critical points on the curve will probably be elevated. Mild diabetes in pregnancy will be seen in patients who are symptom free, and whose dextrose tolerance curve is normal when they are not pregnant.

Disordered Carbohydrate Metabolism of Pregnancy.

In the type of curve associated with disordered carbohydrate metabolism of pregnancy, (*a*) the fasting level may be between 100 and 120 milligrammes *per centum*, (*b*) the maximum value will probably exceed 160 milligrammes *per centum*, and (*c*) most important of all, the height of the curve will still exceed 110 milligrammes *per centum* or even 120 milligrammes *per centum* after three hours.

Figure VI shows typical examples taken from our case histories of each type of curve.

The disordered carbohydrate metabolism appears to be one manifestation of a profound endocrine upset and the importance

of its detection lies in its close association with conditions to which true diabetics are predisposed, namely, premature labour, pre-eclamptic toxæmia and hydramnios in the mother, and stillbirth, neonatal death, gigantism and congenital malformation in the fœtus. It is my opinion that this type of response (disordered carbohydrate metabolism) to the dextrose tolerance test is exhibited by some women who are destined to become overt diabetics in the fourth decade of their lives or later.

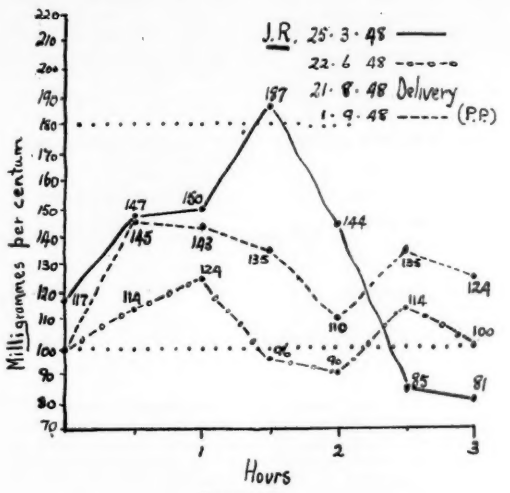

FIGURE V.

It has been found that these "potentially diabetic" or "pre-diabetic" women suffer the same complications of pregnancy as do those who have manifested diabetes during their child-bearing years. (Amongst a spate of literature supporting this contention there has been one contradictory paper, that of Herzstein and Dolger.) The tragic circumstances which one aims to avoid are exemplified in the following case.

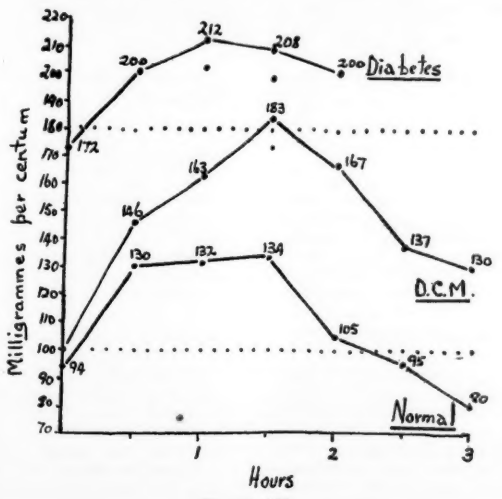

FIGURE VI.

V.R., aged forty years, was admitted to hospital in June, 1946. She had had two pregnancies prior to the present one. The first pregnancy had ended with Cæsarean delivery, three weeks prior to term, of a stillborn fœtus, having a birthweight of ten pounds. The second pregnancy had ended with a difficult instrumental delivery, five weeks prior to term, of a stillborn fœtus with a birthweight of eight pounds five ounces. During the third pregnancy the patient had had no symptoms of diabetes and her urine had been free from sugar when examined at her first ante-natal visit. The pregnancy was terminated by Cæsarean section, six weeks prior to term, on June 28, 1946, but the fœtus, whose birthweight was eight pounds five ounces, suffered a neonatal death. Post-mortem examination of the fœtus revealed the changes characteristic of a fœtus born to a diabetic mother, and a dextrose tolerance test of the mother fifteen days after delivery yielded the curve shown in Figure VII.

I have reviewed 105 dextrose tolerance tests carried out at the Royal Hospital for Women during the past twelve months; 82 tests were performed during pregnancy and 23 during the early puerperium. The method of blood sugar estimation was

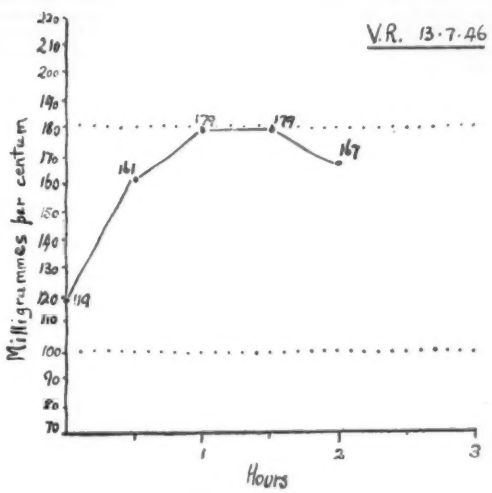

FIGURE VII.

that of Folin and Wu, Herbert and Bourne's technique being used to obtain a protein-free filtrate from capillary blood.

There were 55 normal curves, nine diabetic curves, and 41 curves of "disordered carbohydrate metabolism". The outcome of the pregnancies is shown in Table III.

These figures cannot be regarded as representative of pregnant women generally, because they are taken from women in whom diabetes was suspected for various reasons.

TABLE III.

Results of Dextrose Tolerance Tests on 105 Patients (82 during Pregnancy, 23 during Puerperium) with Associated Complications.

Type of Curve.	Number of Patients.	Complications.	Number of Surviving Infants.
Normal.	55	Intrauterine death .. .. 1 Accidental ante-partum hæmorrhage with stillbirth .. 1 Neonatal death: From congenital malformation 1 From hæmorrhagic disease .. 1 Hydramnios (survival of fœtus) 1	51
Abnormal Carbohydrate Metabolism.	41	Intrauterine death .. .. 4 Stillbirth (1 giant, 1 congenital malformation) .. .. 4 Neonatal death (congenitally malformed) .. .. 1 Hysterotomy at sixth month for hypertension 1	31
Diabetic.	9	Intrauterine death .. .. 2 Stillbirth (giant) .. .. 1 Hydramnios (survival of fœtus) 1	6

Examination of the Fœtus.

Diabetes must be constantly in the mind of the obstetrician when he encounters intrauterine or neonatal death, gigantism or congenital malformation of the fœtus. *Diabetes mellitus* is inherited as a Mendelian recessive, so that a family history of the disease, especially in the female partner, makes it highly possible that herein lies the cause of morbidity of the fœtus.

(So great is the influence of diabetes on the pregnant woman and her child that personal or family history of the disease should be sought in the routine interrogation of every patient at the beginning of her antenatal care.)

Post-mortem examination of the fœtus will from time to time suggest a diabetic inheritance. The history of diabetes in the family and an abnormal result from the dextrose tolerance test sometimes confirm this suggestion. But even should the result of the dextrose tolerance test be normal, the changes in the fœtus are so characteristic that in some cases the pathologist can attribute the fœtal death to diabetic inheritance, and predict the onset of the disease in the mother after the age of forty years with considerable confidence.

The pathology of the fœtus born to the diabetic or "pre-diabetic" mother is discussed below.

Assistance in the Management of the Diabetic Mother.

Management of the pregnant woman who suffers from *diabetes mellitus* has two major medical aspects: (i) control of the carbohydrate metabolism and (ii) maintenance of equilibrium among the sex hormones of pregnancy.

Control of the Carbohydrate Metabolism.

The control of the carbohydrate metabolism and the prevention of acidosis are the province of the physician and the obstetrician. However, laboratory assistance must be available; the lowering of the renal threshold to glucose during pregnancy, and the appearance of lactose in the urine in the puerperium (Table II), render the urine test an unreliable index of the patient's blood sugar content. Repeated blood sugar estimations are imperative for proper supervision of the patient's diabetes.

Maintenance of Equilibrium among Sex Hormones.

Insulin therapy has raised the fertility and pregnancy survival rate of diabetics almost to that of non-diabetic women. But the incidence of late-pregnancy accidents and the fœtal survival rate have not shared this improvement. Joslin has reported that in the pre-insulin era the fœtal survival rate from diabetic mothers in his clinic was 56%; with the use of insulin from 1922 to 1936 this figure had improved only to 62%.

Pregnancy in diabetic women, even with the most exact insulin control, tends to be complicated by various manifestations of water retention, by abortion, by pre-eclamptic toxæmia, by premature delivery, by stillbirth and by neonatal death of the fœtus. Characteristic of the water retention may be hydræmia, abnormal weight gain, hydramnios and visible œdema of the mother, and œdema of the fœtus.

In America, White, Miller, Hurwitz and the Smiths have made an intensive study of the relative amounts of the sex hormones—chorionic gonadotropin, progesterone and œstrogen—in normal and abnormal pregnant women. The gonadotropin and œstrogen they assayed biologically, and the amount of progesterone was determined by the estimation of the urinary content of pregnandiol, its excretion product.

In normal pregnancy in a non-diabetic woman (*a*) the blood level of gonadotropin begins a sharp rise on about the thirty-fifth day after the last menstrual period; it reaches a maximum level between the fiftieth and seventy-fifth days (that is, the seventh to the tenth week) and then falls, to make a secondary rise at about the thirty-eighth week of pregnancy; (*b*) œstrogen and progesterone are produced in early pregnancy by the ovary, later by the placenta; their blood levels increase from about the hundredth day (that is, the fourteenth week) and show a steady rise through pregnancy until the thirty-eighth week, when they fall rapidly just before parturition.

It was found that in about 80% of pregnant diabetics there is (i) an excessive production of gonadotropin, (ii) a low excretion of pregnandiol, and (iii) a relatively low serum level of œstrogen.

Further the Boston group showed that this endocrine imbalance leads to the water retention, pre-eclampsia and other complications listed above.

The abnormal hormone levels precede the onset of pre-eclampsia—being usually the first complication to appear—by some weeks; the hormone balance will fail in the second trimester, whilst the pre-eclampsia usually appears in the third trimester.

It should be noted that the incidence of endocrine imbalance was found to be unrelated to the severity of the diabetes, being no higher in those women requiring insulin than in those who do not.

In 1936 the Americans decided to attempt to correct this abnormal hormone picture. Gonadotropin was not given since it was already present in excess, but œstrogen and progesterone were administered according to their calculated deficiency.

The outcome was a remarkable improvement in the fœtal survival and pregnancy accident rates. This improvement is best illustrated by tables compiled from findings at Dr. Priscilla White's clinic (Tables IV and V). Note that the incidence of pre-eclampsia falls by more than 40% whilst the fœtal survival rate increases by 40%.

Table IV.

Findings at Dr. P. White's Clinic in 1945 among 271 Diabetics Observed since January, 1936.

Hormonal Condition.	Number of Patients.	Incidence of Premature Deliveries.	Incidence of Pre-Eclamptic Toxæmia.	Fœtal Survival Rate.
No hormonal imbalance ..	62	—	1%	97%
Hormonal imbalance untreated	50	40%	50%	52%
Hormonal imbalance treated	157	15%	5%	90%

One of the chief difficulties in this form of treatment is the high dosage of progesterone required and its great cost. Quite recently the Smiths and Hurwitz have demonstrated that the placenta can be stimulated to produce œstrogen and progesterone. Whereas treatment aimed to replace the two hormones must be commenced at the twentieth week of pregnancy, they find that œstrogen administration alone can stimulate the placenta to produce adequate progesterone if it is begun as early as the sixteenth to the eighteenth week. Their experiment is diagrammatically illustrated in Figure VIII.

It will be seen that on the two occasions upon which the œstrogen therapy was stopped temporarily, the pregnandiol excretion (that is, the progesterone secretion) began to fall.

Synthetic œstrogens are relatively inexpensive, so that if œstrogen alone behaves as is claimed, this treatment can be made available to women irrespective of their wealth.

Table V.

Findings at Dr. P. White's Clinic in 1947 among 333 Diabetics Observed since January, 1936.

Hormonal Condition.	Number of Patients.	Incidence of Premature Deliveries.	Incidence of Pre-Eclamptic Toxæmia.	Fœtal Survival Rate.
No hormonal imbalance ..	71	—	2%	97%
Hormonal imbalance untreated	61	40%	50%	44%
Hormonal imbalance treated	204	5%	5%	90·5%

The pathologist may be asked to report whether endocrine therapy is required or if it is adequate. Gonadotropin, œstrogen and pregnandiol assays present considerable technical difficulties, but vaginal smears are simple and may be informative. Smears are made as described by Papanicolaou and Traut; the staining is a matter of personal choice. At the Royal Hospital for Women, Paddington, we are employing the simple single differential stain recommended by Ephraim Shorr,[1] who has made a particular study of changes in the vaginal secretion in endocrine disorders.

With Shorr's stain the three main types of squamous cells have the following appearance:

1. Basal cells: relatively small and rounded, stained a deep blue, and with a relatively large nucleus.

2. Pre-cornified cells: large, rectangular or polyhedral, sometimes folded, stained a greenish-blue, and with a nucleus of moderate size.

[1] Obtainable in this country from Wyeth Incorporated.

3. Cornified cells: large, rectangular or polyhedral, stained pink, orange or yellow, and with a pyknotic nucleus.

Basal cells are usually very scanty in the smear in pregnancy. They become the predominant cell (in a smear numerically poor in cells) when the œstrogen and progesterone secretions are both inadequate, as for example in certain cases of primary amenorrhœa and in menopausal states.

If progesterone and œstrogen are present in adequate quantities—as is the aim in the correctly treated pregnant diabetic woman—the smear is highly cellular with a preponderance of pre-cornified blue-green cells. Progesterone appears to induce desquamation of the epithelial cells before they have become fully cornified. In an adequately treated diabetic woman fully cornified pink, orange or yellow cells should not exceed 10% of the total cells of the smear.

If the secretion of œstrogen is high, but not that of progesterone, the smear will be slightly less cellular with a majority of pink, orange or yellow cornified cells. This is the picture seen in the diabetic whose hormone balance is untreated.

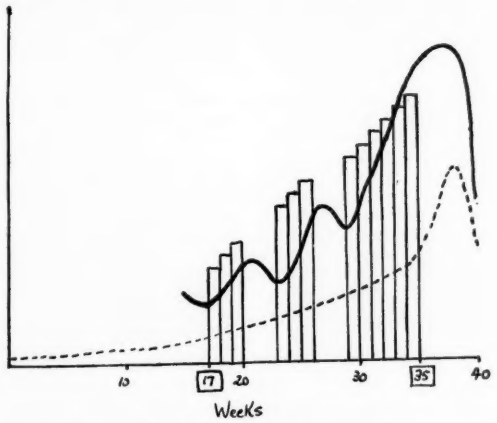

FIGURE VIII.

Pregnandiol excretion (Smith, Smith and Hurwitz, 1946). Normal excretion is shown by the interrupted line, the patient's excretion by the continuous line, and the administration of diethylstilbœstrol by the vertical rectangles.

THE STATE OF THE FŒTUS.

When the fœtus of a mother who is a diabetic or who has a diabetic inheritance is born alive, the pathologist may be asked to estimate the blood sugar level. It was formerly thought that neonatal death of these infants was due to hypoglycæmia from insulin entering their circulation from the mother, and from their own hyperplastic islet tissue. The babies were accordingly given 10% solution of glucose in water at intervals by intramuscular injection. However, it is now realized that normal babies often have a relative hypoglycæmia; the blood sugar level in the first few hours lies between 40 and 60 milligrammes *per centum*. There is a spontaneous rise in the level by the eighth hour. Glucose administration is necessary only if the blood sugar level is below 40 milligrammes *per centum* or is still falling after eight hours. These babies tend to share the water retention which afflicts their mothers and are often œdematous. Fluids are restricted therefore, and diuresis and a rapid early weight loss are noted with satisfaction.

The immediate cause of the fœtal deaths, whether intrauterine or neonatal, appears to be anoxæmia; petechial hæmorrhages on the thoracic organs are customary. But the reason for this asphyxia has not yet been satisfactorily explained.

A post-mortem examination of the fœtus should be made after every stillbirth and neonatal death, if permission can be obtained from the parents. If the following changes characteristic of the babies born to diabetic and "pre-diabetic" women are kept in mind, repetition of the fœtal death may be prevented by treatment in subsequent pregnancies.

Sometimes the mother presents with a history of cessation of fœtal movements (for which there is no apparent cause) close to term, and she is delivered of a baby of greater than average size showing a varying degree of autolysis. On other occasions the fœtus may die during difficult forceps extraction or after impaction of the shoulders due to its great body size. The neonatal deaths may occur at any time during the first week of life, but usually take place in the first forty-eight hours. As stated above, the common immediate cause is unexplained asphyxia.

The autopsy may reveal any one or any combination of the following features.

1. Increased birthweight, sometimes termed macrosomia or fœtal gigantism. The increased weight is due to abnormal over-all body size; the babies are longer than normal, and individual organs are enlarged. In addition there is excess fat, mainly subcutaneous, and œdema is present.

2. Splanchnomegaly or enlarged individual organs. The organs particularly affected are the liver, the heart, the spleen and the suprarenals. In a male baby born of a diabetic mother two and a half weeks prior to term and weighing nine pounds four and a half ounces, the following organ weights were found. The normal weight for each organ for a seven pounds male baby is shown in parentheses: liver, 240 grammes (162 grammes); heart, 42 grammes (23 grammes); left suprarenal, 10 grammes (4·9 grammes); right suprarenal, 10 grammes (5·1 grammes).

3. Hyperplasia of the islets of Langerhans. Whilst the overall size of the pancreas does not seem to be increased, there is hyperplasia of the islet tissue at the expense of the remainder of the gland. In one of our infants the islets occupied one-third of the total tissue in some lobules of the gland, and whereas the average diameter of the islets in normal babies is about 77μ, in one of our cases the average diameter was 138μ, and in another it was 220μ.

4. Excessive extramedullary hæmatopoiesis. As might be expected, excessive erythropoiesis is most conspicuous in the liver, and it may be microscopically indistinguishable from that seen in hæmolytic disease of the newborn. It is possible that this change may have its origin in the endocrine imbalance, for apparently the administration of gonadotropin can stimulate extramedullary hæmatopoiesis in the normal subject.

5. Congenital malformation of the fœtus. White and Hunt state that whereas in the offspring of non-diabetic mothers a congenital defect will occur once in every 55 babies, in the case of diabetic mothers a congenital defect may be anticipated once in every six babies.

6. An increase in the eosinophilic elements of the anterior part of the pituitary body.

Many of these changes in the fœtus would appear to support the contention that in those with a diabetic inheritance, the altered carbohydrate metabolism is but a manifestation of a widespread endocrine disturbance.

CONCLUSIONS.

1. The diagnosis of diabetes in pregnancy requires examination of the patient's dextrose tolerance, due consideration being given to her state of nutrition. A family history of the disease should be sought.

2. The dextrose tolerance curve which is not quite normal, in that it does not fall to 110 milligrammes *per centum* or less in three hours (the condition called "disordered carbohydrate metabolism of pregnancy"), may be exhibited by "pre-diabetic" women.

3. Unexplained intrauterine or neonatal death of a fœtus of greater than average size should arouse suspicion of a diabetic inheritance in the mother. Characteristic findings in the fœtus at autopsy may confirm this suspicion.

4. Maintenance of equilibrium among the sex hormones is necessary to ensure continuance of the pregnancy and survival of the fœtus of a diabetic woman. Examinations of vaginal smears offer a simple, if approximate, method of control of endocrine therapy.

5. If women of the "pre-diabetic" group can be detected, endocrine substitution therapy may result in an improved fœtal survival rate such as has been achieved in frankly diabetic women.

ACKNOWLEDGEMENTS.

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BIBLIOGRAPHY.

Archer, H. E., and Haram, J. (1948), "Reducing Substances in the Urine in Pregnancy and the Early Puerperium", *The Lancet*, Volume I, page 558.

Eastman, N. J. (1946), 'Diabetes Mellitus and Pregnancy", *Obstetric and Gynecological Survey*, Volume I, page 3.

Fearon, W. R. (1942), "The Detection of Lactose and Maltose by Means of Methylamine", *The Analyst*, Volume LXVII, page 130.

Hale-White, R., and Payne, W. W. (1926), "The Dextrose Tolerance Curve in Health", *The Quarterly Journal of Medicine*, Volume XIX, page 393.

Herzstein, J., and Dolger, H. (1946), "The Fœtal Mortality of Women during the Pre-diabetic Period", *American Journal of Obstetrics and Gynecology*, Volume LI, page 420.

Hurwitz, D., and Irving, F. C. (1937), "Diabetes and Pregnancy", *The American Journal of the Medical Sciences*, Volume CXCIV, page 85.

Hurwitz, D., and Jensen, D. (1946), "Carbohydrate Metabolism in Normal Pregnancy", *The New England Journal of Medicine*, Volume CCXXXIV, page 327.

Joslin, E. P., *et alii* (1946), "The Treatment of Diabetes Mellitus", Eighth Edition.

Miller, H. C., Hurwitz, D., and Kuder, K. (1944), "Fœtal and Neonatal Mortality in Pregnancies Complicated by Diabetes Mellitus", *The Journal of the American Medical Association*, Volume CXXIV, page 271.

Miller, H. C. (1945), "Cardiac Hypertrophy and Extra-medullary Erythropoiesis in Newborn Infants of Pre-diabetic Mothers", *The American Journal of the Medical Sciences*, Volume CCIX, page 447.

Miller, H. C. (1945), "The Effect of the Pre-diabetic State on the Survival of the Fœtus and the Birth-weight of the Newborn Infant", *The New England Journal of Medicine*, Volume CCXXXIII, page 376.

Shorr, E. (1945), "An Evaluation of the Clinical Applications of the Vaginal Smear Method", *The Journal of the Mount Sinai Hospital*, Volume XII, page 667.

Smith, O. W., Smith, G. van S., and Hurwitz, D. (1946), "Increased Excretion of Pregnandiol in Pregnancy from Diethylstilbœstrol, with Special Reference to the Prevention of Late Pregnancy Accidents", *American Journal of Obstetrics and Gynecology*, Volume LI, page 411.

Soskin, S., and Levine, R. (1946), "Carbohydrate Metabolism".

White, P., Titus, R. S., Joslin, E. P., and Hunt, H. (1939), "The Prediction and Prevention of Late Pregnancy Accidents in Diabetes", *The American Journal of the Medical Sciences*, Volume CXCVIII, page 482.

White, P., and Hunt, H. (1943), "Pregnancy Complicating Diabetes", *The Journal of Clinical Endocrinology*, Volume III, page 560.

White, P. (1936), statistics of pregnant diabetic women treated since January, 1936, from a personal communication to Dr. J. Kempson Maddox.

Welden, S. (1948), "Investigation of Carbohydrate Metabolism in Normal Pregnancy", THE MEDICAL JOURNAL OF AUSTRALIA, Volume I, page 646.

TREATMENT OF TETANUS, WITH REPORT OF A CASE OF TETANUS NEONATORUM IN WHICH RECOVERY OCCURRED.

By A. R. EDMONDS AND K. W. LAVERS,
Perth.

THE treatment of tetanus is a gamble with death in which the dice are loaded. Certain principles of treatment have been evolved which may influence the outcome. There is a defeatist attitude which suggests that the mortality of the cases in which the incubation period is under seven days is practically total; and that if this period is over nine days the outcome is favourable whatever the treatment. This attitude leaves but a small group upon which therapeutic enthusiasm can be expended. We consider this attitude indefensible, whatever figures may suggest. The almost invariably fatal outcome in cases of tetanus of the newborn has produced a fatalistic attitude in this disease, which the case report which follows may do something to dispel.

The primary factors in the handling of a case of tetanus would appear to be as follows.

1. The provision of an excess of antitoxin to the patient. Most authorities agree that 200,000 U.S.A. units of tetanus antitoxin should be the initial dose. To any but very small children we have made a practice of giving 100,000 units as soon as the diagnosis is made, and the other 100,000 over the next twelve to twenty-four hours. After that it seems justifiable to give more if there is any evidence of continued production of toxin. This evidence may be assumed if the spasms, after some diminution, tend to recur. We can see no justification for small dosage on theoretical grounds, as the majority of authorities are in favour of the above-stated dosage.

2. The maintenance of sufficient sedation. Enough is required to keep that nice balance between the minimum of spasms and aspiration-bronchopneumonia or drowning. The whole gamut of hypnotics and anæsthetics has been used, and the choice nowadays seems to rest between the quickly or slowly acting barbiturates, thiopentone, "Avertin" or sometimes chloral hydrate and/or bromides. A moderate experience with most of these shows that all individually or in combination have their places. Recent experience in six or seven cases suggests that the best is rectally administered "Avertin". This is given in dosage sufficient to produce full basal narcosis by a single rectal instillation according to the weight in the first instance. It is then followed by more or less continuous rectal drip administration of a 2·5% solution in distilled water made up with the usual precautions for this drug. The rate of administration is controlled by results rather than by any theoretical considerations. With "Avertin" we feel that we have had better control and more satisfactory sedation. There has been a considerably shorter duration of the anxious period of excessive moisture in the respiratory tract. With previously tried methods, one frequently saw violent spasms alternating with longer or shorter periods of apparent drowning in the secretion of the bronchial tree, associated with the absence of a cough reflex.

3. The elimination of the organism. Local excision of the infected part should be practised if possible. Penicillin in adequate dosage is indicated. Doubt exists whether either of these procedures is very effective, but there are no contraindications to the latter and the former is qualified by "if possible".

4. The provision of adequate fluid, electrolytes, protein and Calories. This is a problem of no mean order. In a severe case this may need extremely close watching and probably receives the least attention as far as detail is concerned. We think this should be planned from the onset of treatment. It is rarely possible in a severe case to provide nutrition in the usual manner. Attempts to feed by mouth either bring on more spasms or (if the patient is adequately sedated) are impossible. Feeding per tube is, in our opinion, contraindicated. The result of tube feeding is aspiration of regurgitated gastric content whether the food is given intermittently or by a continuous drip. This statement may evoke contradiction, but our experience has demonstrated its dangers. This leaves intravenous therapy as the means of supplying nutrition. Provided adequate charts are kept and the therapy is intelligently planned and policed, and that clinical observation is not entirely replaced by laboratory data and recorded statements, and above all, that the electrolyte balance is kept within the limits of the capacity of the kidney, it can be done. We have noticed a marked difference in the state of nutrition of patients who recover since we have been using more intelligence with the intravenous therapy, and it is fair to assume that mortality must be reduced in cases in which the nutrition is more adequately maintained.

In order to achieve these four cardinal lines of treatment, two things are necessary: first, a devoted medical officer who is prepared to follow each case through to the end with more or less continuous observation, and secondly, a nursing staff who will apply themselves to the job of carrying out the orders with intelligence and discretion and make accurate observations and record these observations accurately.

In presenting this case of *tetanus neonatorum*, which exemplifies the principles of treatment, we are attempting to record an isolated success. Only the permanent staffs of hospitals have any wide experience in handling tetanus (and the rarity of *tetanus neonatorum* in this country is exceeded only by the rarity of recovery from the disease). One of us has seen six cases of this disease in the short space of six years in pædiatric hospital practice. The diagnosis is very simple in an established case. A baby with a fairly brief history, first of being unable to swallow, then, fairly soon, of being unable to open the mouth, with development of generalized stiffness, appears at hospital with the following pathognomonic sign: a moderately mild stimulus, such as a gentle prod with the forefinger in the abdomen, produces a perhaps brief but typical spasm—clenched hands, generalized stiffening, *risus sardonicus* and the typical grunting respiration of the victim of tetanus in spasm. By the time this sign appears there is no doubt about the diagnosis and very little about the outcome. Earlier there are three conditions which should be considered. They are as follows: (1) cerebral trauma, which

generally makes itself manifest earlier, but not always; (ii) meningitis, which occasionally suggests itself, though the main point is that a newborn with meningitis looks extremely ill by the time any cerebral signs appear and the bulging fontanelle and the result of lumbar puncture are conclusive; (iii) tetany of the newborn, which is fairly easily eliminated; generalized convulsions are the normal presenting signs, and the presence of carpo-pedal spasm with Trousseau's sign is very different from the clenched fists of tetanus.

Umbilical sepsis has been present in all the cases I have seen and is the commonest cause of tetanus in this age group. The sepsis is generally not very pronounced in its signs. Talc powder and cord ties have been incriminated in some cases and just plain dirt in others.

From 1934 to March, 1949, there have been 44 cases of tetanus recorded in this hospital. Of these, four were in newborn babies (Figure I). The over-all mortality was 21 (47·7%). If one deletes the four cases of tetanus of the newborn the mortality rate is 45%.

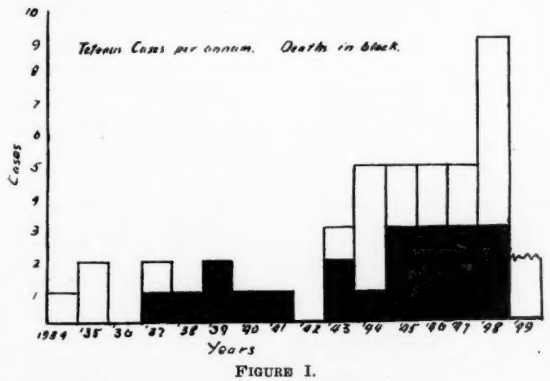

FIGURE I.

Little information is to be gained from the examination of the figures in so small a series. But it must be emphasized that, given a knowledge of the principles of treatment, the application to any individual case requires individual care and experience if the mortality is to be lowered. One interesting feature which may be significant, however, in examination of this series, is the fact that prior to 1945 in no case with an incubation period less than nine days did the patient recover, while since that date three in this class have done so.

Case Report.

K.S., aged ten days, was admitted to the Perth Children's Hospital on June 17, 1948. He was the second baby of healthy parents. Delivery had been normal. He had been taking his feeds with difficulty for three days before admission to hospital. About twelve hours before admission he had been seen to become generally stiff while feeding and had had several recurrences of this with some stiffness between spasms. He had been circumcised two days before admission. Spasms interfered with his ability to suck, but otherwise there were no abnormal signs.

On admission to hospital he was found to be a small, well-formed baby, all of whose musculature appeared to be in constant spasm. The abdominal muscles were rigid, trismus was present, the hands were tightly clenched and *risus sardonicus* was present. The umbilicus was somewhat reddened, but no pus was seen. The infant had had phenobarbital, half a grain, before admission. This was continued in the dosage of half a grain three times daily for the first twenty-four hours, when it could be given orally.

An intravenous drip infusion was commenced almost immediately after admission and five millilitres of calcium gluconate 25% solution were first injected. As this caused no change the diagnosis of tetany was excluded. The blood calcium content, estimated shortly afterwards, was found to be normal.

Antitetanus serum (40,000 units) was then added to the flask of the infusion apparatus after a skin sensitivity test had produced no reaction. This was repeated on the following day and again two days later. Penicillin was given intramuscularly and its administration continued until July 10, 1948. It was not given intravenously, as it has been found that non-crystalline penicillin greatly shortens the life of an intravenous drip infusion. An oxygen tent was used continuously for two weeks. Intravenous drip therapy was continued until July 16, 1948, except for an interval of one week, during which he received tap-water rectally in addition to small amounts of fluid orally. Nine intravenous infusions were given altogether, including one into a scalp vein.

At first 200 millilitres of half-normal Ringer's and 5% glucose solution, to which 70 millilitres of "Parenamine"[1] were added, were given alternately with 10% glucose solution at the rate of 30 to 40 millilitres an hour. After five days this was reduced to 25 millilitres per hour, when it was found that adventitious chest sounds were increasing. Numerous râles had been continuously present, owing to the large amounts of mucus in the respiratory tract, which needed frequent suction.

Occasionally blood and serum were added to the drip apparatus. Frequent serum protein estimations were not made; each one would have needed four millilitres of blood, and it was felt that every drop of blood must be preserved, as veins were so precious. The general condition was apparently kept fairly satisfactory by prevention of the appearance of dehydration. The blood hæmoglobin value was kept constantly high. Vitamins were given parenterally at first, later by mouth. Fluid obtained by lumbar puncture on June 18, 1948, showed no sign of xanthochromic staining, a finding excluding the unlikely possibility of cerebral hæmorrhage.

Spasms.

A typical spasm was characterized by a general increase in rigidity, exaggeration of *risus sardonicus*, great respiratory embarrassment and pronounced cyanosis. General stiffness was always present between spasms until shortly before the patient's discharge from hospital, when it was lessening considerably. It was absent on only one occasion, when it was considered that he had been over-supplied with sedative.

In the first twenty-four hours after admission there were about five spasms with pronounced cyanosis, lasting up to two to three minutes, usually occurring when necessary stimuli were given during treatment. Frequency of spasms then increased, but when "Avertin" therapy began a great decrease in frequency, severity and duration occurred.

Feeding.

At first it was found quite impossible to give any fluid by mouth. Swallowing and sucking did not occur, and the slightest interference in this regard would precipitate a severe spasm. A cautious attempt after one week to insert a tube into the stomach by the intranasal route caused a severe spasm and was abandoned.

No fluids were taken by mouth until ten days after admission, when small amounts of diluted condensed milk were able to be swallowed when given by pipette, and were occasionally retained. Other forms of milk, including lactone-syrup milk, were tried without success. The amounts of milk taken were gradually increased and the concentration of milk was gradually increased to one part of condensed milk to nine parts of water.

By the nineteenth day about a pint of milk was being retained per day, and then a gradual change to lactone-syrup milk was begun. It was found possible to add a tablespoonful of "Casydrol" daily to feedings. "Parenamine" was tried by mouth, but was not tolerated. "Pentavite" now replaced parenterally administered vitamins. Iron administration was commenced on the twenty-fifth day in the form of *Ferri et Ammonii Citras*.

On the thirty-sixth day "Ideal Milk" in increasing quantities was added to the diet, replacing lactone-syrup milk. The concentration of "Ideal Milk" was increased rapidly to one part to two and a half parts of water. Administration of "Casydrol" was discontinued when this change occurred. Casein was added to the diet shortly before the patient's discharge from hospital, in amounts increasing to three teaspoons daily.

Sedation.

On the second day it was found that spasms were occurring with every minor disturbance. This continued on the third day until the form of sedation was changed to "Avertin" in 2·5% solution given by intermittent drip through an indwelling rectal tube. Intravenous drip apparatus was used, and the amount measured by counting the number of drops.

[1] "Parenamine" (Stearns) is a 15% solution of amino acids prepared for intravenous use.

An initial dose of 10 millilitres was given, then four millilitres were given hourly. After seven hours collapse occurred with feeble pulse, rapid shallow respirations, and general flaccidity. "Avertin" administration was then discontinued for twelve hours and was recommenced and employed as necessary.

Twenty-eight millilitres of "Avertin" were given on June 22, 1948 (second day of "Avertin" administration), and about the same quantity was given each day until July 1, 1948, when only seven millilitres were used. Its administration was then discontinued and no further spasms occurred; however, general stiffness remained, so that the hands could not be unclenched, though they were relatively loose during sleep. The baby could now, and for some weeks later, be lifted stiffly without any flexing of the body by placing one hand behind the neck, the feet only being in contact with the bed. The lower limbs were fixed in a scissors position with crossed legs and full external rotation, so that the corresponding toes of the two feet were almost pointing at each other. This position of the limbs was still present when the child was discharged to the out-patient department. Although no further spasms occurred, phenobarbital (one and a quarter grains a day) was used soon after the "Avertin" administration was stopped.

Complications.

Three days after the cessation of "Avertin" administration inguinal herniæ were noticed. These rapidly became very large indeed. With continuous high intraabdominal tension, increased further when crying occurred, it needed such a great amount of force to replace the herniæ (which immediately bulged back again) that trusses at first were not used, as it was thought that they might be more dangerous than no treatment at all. On the twenty-sixth day, eight days after the herniæ were noticed, bile-stained vomiting, abdominal distension and a very tense right-sided hernia indicated intestinal obstruction. Gastric suction was instituted, the herniæ were replaced under extra sedation and woollen trusses were able to be used effectively. The infant soon recovered from this crisis.

Shortly afterwards, Bryant's extension was used instead of the truss and was found effective in keeping the herniæ reduced except when the child was crying. After three weeks this was abandoned and it was found quite safe to allow the herniæ to be down all the time.

The use of curare was contemplated soon after the herniæ appeared, but in view of unenthusiastic reports it was decided to persevere without it if possible.

Final Result.

The baby was discharged from hospital on August 30, 1948, his weight then being seven pounds four ounces. His birth weight had been seven pounds eight ounces. He weighed only slightly over six pounds a month before discharge, and there was a gradual weight rise from then until and after discharge. At the age of eight months his weight is now seventeen pounds nine ounces, and he appears to be a perfectly healthy baby, except for the herniæ, which are very large but give no trouble and have as yet had no treatment since he left hospital.

Physiotherapy was used before and after discharge to remove the tight clenching from the fingers and to remove the abnormal fixed position from the lower limbs. This has now been completely successful.

Summary.

1. An outline is given of the principles of treatment of tetanus. There are four main features: (i) provision of antitoxin—at least 200,000 U.S.A. units for all but very small children; (ii) adequate sedation, rectal administration of "Avertin", 2·5% solution in water by continuous or intermittent drip being most favoured; (iii) elimination of the organism by excision and the use of penicillin; (iv) maintenance of nutrition and fluid balance by intravenous therapy.

2. A case of tetanus in the newborn is described, in which recovery took place. The age at onset was ten days. The site of infection was the umbilicus. The dose of antitoxin was 120,000 U.S.A. units. Sedation was obtained with 2·5% solution of "Avertin" given by intermittent rectal instillation. Other treatment included the administration of penicillin by the intramuscular route, glucose and electrolyte by continuous intravenous infusion, amino acids, blood, serum, and oxygen. A complication was bilateral inguinal hernia with incarceration and obstruction.

THE CONSERVATIVE TREATMENT OF THE INJURED BACK.[1]

By Stuart H. Scougall,
Sydney.

The proportion of people who go through life without back symptoms at some stage or other must be relatively small, and lesions of the area figure largely in the litigation of compensation and rank high in the causation of economic and industrial loss and personal suffering.

The diskogenic syndrome looms large as the chief present issue in the category of lesions of the injured back, and its differentiation necessitates some reference to other traumata of the back, and to topical lesions having some similarity in the clinical picture. In its early stage the diskogenic syndrome entails, of course, a ligamentous lesion, even though degenerate changes or congenital weakness of the chief ligament concerned play a prominent part as the predisposing cause. While we are becoming accustomed with some reason to think in any case of low-back trauma predominantly of the disk syndrome as the central figure upon the stage, perhaps strutting across the stage, it may also be well to remember that some primary incidence of trauma in the back is upon the muscles and ligamentous structures themselves, in common with other weight-bearing areas such as the ankle and the knee. It would be strange if the spine, with its weight-bearing function, complex articular anatomy, and range of movement, did not also sustain frequent frank muscular strain and ligamentous lesions, with the latter often involving joint movement beyond the normal range. The difficulty in intimate recognition, in many such cases, would lie in the anatomical complexity and the relative inaccessibility of the areas affected. This prime issue of trauma stands embossed against the local and general background of arthritis, degenerative and otherwise, congenital and acquired structural and postural abnormalities, constitutional disease, and psychological factors. The field therefore is no exception in the importance of the personal element. The background factors and the associated conditions entering the differential field have been well covered elsewhere by Platt and others and will not be considered here other than in pertinent incidental reference.

The broad issue of fractures and dislocations is by consent precluded, except again where some incidental factor may make it germane to the central topic.

Since physical therapy, the very life blood of physical medicine, figures so largely in the treatment of lesions of muscle and ligament unaccompanied by the disk syndrome, this common ground with orthopædics, to avoid an overlap, has been left to the paper on physical medicine.

Nor will I enlarge upon the medical therapeutics concerned in sedation.

Bearing in mind the nature of this meeting and the fact that these are the opening remarks, I have therefore concluded that my central topic should be the diskogenic syndrome and that my contribution might include some brief consideration of recent related anatomy, physiology and pathology, those fundamentals upon which advance may be made when related to clinical evidence, which indicates paths of prospective investigation. For with realization of what has been done so far in elucidation of these problems, there is general acceptance of the striking incompleteness of this fundamental knowledge, and Dr. Gilbert Phillips informs me that perhaps in no sphere is this so lacking as in that of the neurophysiology of posture. Treatment so based must have obvious limitations and corresponding results. In the light of such consideration these remarks on the conservative treatment of the injured back will be addressed particularly to the fundamental factors and the related orthopædic aspects of posture, immobilization and mobilization.

[1] Read at a meeting of the Section of Orthopædics and Physical Medicine, Australasian Medical Congress (British Medical Association), Sixth Session, Perth, August, 1948.

Bulging and restoration may account for early symptoms of disk protrusion, but it seems more likely that the common episodal history represents increasing disk protrusion.

Pain is a dominating and almost exclusive symptom in this syndrome, a crucial therapeutic target, and the critical yard-stick of the patient.

Pain remains an absorbing investigation to a host of workers, and Wyke (1947) has recently given us a summary from the anatomical aspect. The suggestions of Harmon (1948) from the physiological aspect urge our orientation towards perception of pain as a cerebral cortical projection. He suggests that pain is best regarded as a projection from the brain, not actually felt in any particular body structure, and determined as much by cortical anatomy as by any other body structure. He regards it as proven that there is only one kind of deep pain and that it is not divisible into local and referred. He suggests that pain from parts of the body unperceived by the cortex (in distinction from superficial sensation) is projected into the perceived parts of the body and has a segmental basis derived from the fixed structures of the cortex.

Lewis also, in 1942, concluded that deep pain always had a spreading segmental distribution.

Wyke states in summary that pain is perception of a variety of physiologically distinct responses, blended at supramedullary levels, with psychic and somatic reactions.

In the present knowledge of pain it seems difficult to be dogmatic in its interpretation. In these syndromes it is obvious that the ligaments, apophyseal joints, *annulus fibrosus* and other structures are among the unperceived portions of the body.

Roofe (quoted by Spurling and Grantham, 1940) states, from his dissections, that a branch of the sinu-vertebral nerve descends the full length of two vertebræ, but recent French anatomical studies (Lazorthes *et alii*, 1947) provide no evidence of any downward distribution of this nerve. The anatomy of this nerve has obvious bearing on the dermatomes of pain distribution.

Prominent among the signs in the local examination of back lesions is the sciatic scoliosis or list, generally contralateral and occasionally reverse or alternating, and maintained in recumbency. This list is widely assessed as a relief posture from pain and the constant maintenance of such a malposture results in the loss of the rest mechanism in the back in the upright posture; there is, in addition, associated continuous overloading of muscle function when there is loss of spinal equilibrium. There may be secondary effects in complication, the understanding of which may clarify some aspects of the clinical picture, throw light on ætiological factors and help in treatment. Some reference, therefore, to rest mechanisms is pertinent.

Professor J. L. Shellshear deals with the ligamentous structures of this ilio-lumbar region in a paper in course of publication, generously made available to me.

In general, while pressure stresses in the upright posture are taken substantially by the bony mechanism, tensile stress is a function of white fibrous tissue, commonly ligaments, and there is close working association between ligaments and corresponding muscle throughout the body. A typical example is found in the ilio-psoas muscle with the underlying Y ligament of the hip joint. At the lumbo-sacral junction the *quadratus lumborum* with the psoas is in the same relation to the ilio-lumbar ligament. Static stability in general is ligamentous, and movement stability is muscular, and muscle is the first line of defence.

Rest mechanisms in the upright posture are important in economic muscular function. These mechanisms are well shown in the habitual posture of *hanchée* with the body weight predominantly on one leg alternating with the other. At the knee we lean on the anterior cruciate ligament in locked extension with minimal effort to the quadriceps. At the hip we lean on the Y ligament, and at the lumbo-sacral joint on the ilio-lumbar and associated ligaments. In the lower part of the back *hanchée* results in a scoliosis and the ilio-lumbar ligaments on the convex side of the curvature economize for the *quadratus lumborum* and the other groups on the convexity. The mechanism is reversed when we lean on the other leg. This is the common resting mechanism in standing, first on one limb and then on the other. This mechanism is carried a step further in the Australian aborigines (Elkin, 1948), the Nilotes, and certain other native groups, when the resting foot is placed against the lower part of the thigh on the opposite side and a spear is used for balance. Factors in avoiding muscular fatigue are ligamentous locking, bilateral alternation, and the fascicular chain of postural contraction.

The relatively fixed spinal list in the low back lesion prevents the operation of this alternating rest mechanism so that we would expect *per se* fatigue and pain. In addition, when there is loss of equilibrium and the spine may be said to lose compensation, there is an added constant overloading of the muscles on the convex side. We know that in idiopathic scoliosis, where loss of equilibrium results in a list with displacement of the centre of gravity, pain in the lower part of the lumbar region results. It would be of interest to know whether such a list imposed upon a normal volunteer would result in similar pain. In two such tests over a period of ten days lumbar pain resulted, but further work is necessary for elaboration of this point; other secondary results are under examination with the help of Dr. Gilbert Phillips, in the department of surgery of the University of Sydney, including the functioning of the myotatic reflex under these conditions. I will return to this postural factor in the discussion of rest in the use of plaster of Paris jackets, but at present, in view of the loss of the rest mechanism and the overloading of muscle function with their consequent sequelæ, I suggest the inadvisability of allowing patients to get about with loss of postural equilibrium due to a list, in this syndrome, either during conservative treatment or in the post-operative stage.

It is generally accepted that the list is of the nature of a relief posture, but this needs confirmation. Elliott (1944) has shown by electromyography that pain in any dermatome of the sciatic distribution is accompanied by localized areas of spasm, a finding which allows an interesting inference on the nature of pain in the Lasègue test. The list is often accompanied by spasm recognizable clinically and it is possible that the list may be an obligatory posture; some evidence on this, too, may be gained by further electromyography and other planned procedures at present under way.

The subject of back injury in its many aspects has been frequently reviewed in the literature of recent years and one of the most comprehensive reviews comes from Charles Gray (1947). In acute and severe cases of the disk syndrome, recumbency is the mode of rest indicated by Gray, and this in many cases gives substantial relief from pain. It would certainly obviate such secondary symptoms in these cases, in which overloading of the muscles on the convex side of the list results from the loss of equilibrium, and it would remove the aggravation by body weight of any disk protrusion. Where effective, it has the additional advantage of allowing postural changes consistent with the position. But I incline to the view that where list continues in recumbency, a condition suggestive of continuing spasm, such immobilization may not be optimal. In many such cases there would be recent protrusion, and we would have the local effects of traumatic inflammation with tension due to exudate. In accounting for subsidence of symptoms in the presence of a continuing protrusion, Falconer (1948) states that the nerve root may elongate. Reduction of the products of traumatic inflammation is a probable factor. Also, symptoms may continue for a period after the pressure ceases to exist owing to contusion of a nerve root. Maximum rapidity of absorption and uninterrupted healing can, I feel, best be promoted by immobilization of the torso as in a plaster of Paris jacket, the patient still being kept in recumbency in the initial stages after its application.

Charles Gray states that the list cannot be undone by active or passive movement, and this is so in general; nor would it be desirable to attempt to alter forcibly a posture

of protective spasm. In such cases, therefore, generally of suspected disk protrusion in which jacket immobilization is indicated, it is common practice to apply the jacket in the malposture of the patient. Under these conditions the processes of repair, with the possibility of later adhesions, take place in the position of malposture. If jackets are used in this way they should be changed early, possibly after about two weeks, in favour of one in normal posture. But immobilization in normal posture can, in general, be effected from the first. If a patient is partly suspended in suitable apparatus, with a Glisson sling and cervical traction applied obliquely in a direction of correction, the spasm disappears and the patient generally reaches normal posture. In an occasional case *effleurage* is a help, as also is simple sedation, and possibly local anæsthesia. This does not constitute the breaking down of protective spasm by force as the spasm readily disappears under these conditions. I do not remember any case in which a jacket in normal posture was not obtained without undue worry to the patient. When a patient recovers without operation, the rehabilitation of convalescence begins with the patient in a normal posture. I therefore suggest for your consideration that when immobilization in a jacket is desirable, the list be corrected as early as possible, and preferably *ab initio*. In practice, particularly with well-covered patients, the limitations of retention are such that some slight over-correction may be used, as there is loss of correction when the patient in the jacket is released from the application apparatus. With well-applied jackets, I think there are not many more graphic pictures in our professional work than the immediate, almost complete, relief from pain, particularly in the back, generally obtained even by the patient with the severe disk lesion, previously scarcely able to stand. Immobilization is the sheet-anchor of the acute stage of the low-back sciatic syndrome. For a suspected diskogenic syndrome I think the period should be six weeks.

When a list persists late in the convalescent stage after operation, and there is no reason to suspect further disk protrusion elsewhere, I think consideration should be given to the use of a jacket in correction, as in the conservative stage. I have seen cases in which this has apparently been the turning point in rehabilitation.

Its antithesis in the form of mobilization or manipulation has been in wide use during the residual or chronic stage, primarily in the form of stretching by the physiotherapist, and where this is unsuccessful, by the surgeon, the patient being as a rule under general anæsthesia. Some neurosurgeons report having seen untoward results from manipulations, including palsies, and a review of the method is therefore indicated. It is common experience for orthopædic surgeons of wide practice with manipulation of the spine to see no untoward results in a lifetime of work. This raises the question of the mode of manipulation and the indications for the procedure. There is no final agreement as to the rationale of manipulation. I cannot exclude, among other possibilities, the age-old conception of adhesions. We have very positive evidence of this at other joints.

It is interesting to note that Falconer *et alii* (1948) state that in reoperation for recurrent symptoms the nerve roots and theca are invariably found to be bound down by more scar tissue to the posterior aspect of the disk where it was previously explored. Yet in the assessment of post-operative disability in sciatic types of case, 36% of patients had only slight discomfort and 36% had no discomfort, a total of 72%. Apparently this firm adhesion of the nerve root to the site of the disk removal is consistent with absence of significant symptoms and no limitation of straight-leg raising.

I hesitate to accept the possibility that a disk may be replaced. It seems possible that it may shift from impingement on a root, and manipulation may relieve a joint locked mechanically or by spasm. The vertebra above a diminishing disk on subsiding may move backwards or forwards or keep the same alignment. Falconer *et alii* (1948) quote a case of potential spondylolisthesis which became objective after laminectomy, but when the *pars interarticularis* is intact the fourth and fifth lumbar vertebræ frequently move slightly backwards. Dr. R. Hamilton Kenny was not convinced that the apophyseal joint alignment was responsible, and Dr. Gilbert Phillips suggested the possibility of some relationship with the myotatic reflex.

The pitfalls of manipulation are those of wrong diagnosis due to inadequate investigation and include widespread bone malignancy in an early stage, not recognizable radiologically, disk tuberculosis, (Falconer, McGeorge and Begg, 1948), disk protrusion, tumour of the *cauda equina* and fixed dural endothelioma.

Some discussion of the basic factors of anatomy and physiology may help in determination of what the present sphere of manipulation should be.

Exacerbation of the disk lesion by manipulation lies in the possibility of further protrusion, tautening of the nerve roots over the prominence of the protrusion, compression of the nerve root against such fixed structures as bone or ligament, and diminution of the size of the intervertebral canals and their foramina. Manipulative movement therefore should be related to these factors.

I am indebted to Dr. W. Herlihy for help in the field of spinal movement. The terminology used here follows the suggestion of Dr. R. Hamilton Kenny in keeping the term intravertebral for the main vertical canal of the whole spinal column, the term intervertebral for the bilateral canals between two adjacent vertebræ, and the term intervertebral foramen for the constricted portion of the intervertebral canal.

TABLE I.

Spinal Posture of Conscious Patient.	Effect on Disk Protrusion.	Effect on Nerve Length.	Effect on Intervertebral Canal.
Extension.	? Diminishing } (a)	Tautening.	Narrowing→ enlarging.
Flexion.	? Increasing } (a)	Tautening.	Enlarging.
Lateral flexion—			
(a) Concavity.	Increasing.	Slackening.	Narrowing
(b) Convexity.	Diminishing.	Tautening.	Enlarging.
Rotation—			
(a) Towards.	Probably not significant.	Slackening. (Kenny.)	Probably not significant.
(b) Away from.	Probably not significant.	Tautening. (Kenny.)	Probably not significant.

The size of the intervertebral canal is increased in flexion and diminished in extension, increased in lateral flexion on the convexity and diminished in lateral flexion on the concavity; in rotation there is no significant change.

In regard to tautening of the nerve roots there is a tendency in this direction in both extension and flexion of the spine, since in these movements the vertebral column is displaced caudally by three or four millimetres in reference to the spinal cord.

In regard to the effect of rotation of the spine on the nerve, Dr. R. Hamilton Kenny (1948) suggests that there is a tendency towards laxity on the side towards which rotation is made and tautening of the contralateral side, but work is proceeding further on this aspect in the Department of Anatomy in the University of Sydney.

Dr. R. Hamilton Kenny's investigation into the anatomy of the lumbar spinal nerves and intervertebral canals is in course of publication and was generously made available to me. It brings definition to obscurities and adds facets to the anatomical knowledge of this area, and I am indebted for some of his slides. An interesting sidelight is his observation that the spinal nerve trunk scarcely exists in the longitudinal sense, being mainly a region of fibre decussation one to two millimetres in length, and in longitudinal or cross section having an area of a few square millimetres. Its situation is in the lateral end of the canal immediately distal to the ganglion. Evidence is also brought forward indicating the probable existence of sympathetic fibres in the sinu-vertebral nerve of Luschka, which branches from the anterior ramus almost immediately, returns through the canal and is distributed to the *annulus fibrosus*, posterior longitudinal ligament and body of the vertebra.

These relationships can be seen in Table I.

Hyperextension of the spine has been examined in the acrobat as an indication of the possible effects of this movement in manipulation, and relative figures were obtained from X-ray pictures taken by Dr. Alexander Owen (Table II). The subject had been performing acrobatics fairly constantly for over twenty years. She required fifteen to thirty minutes to "limber up" before the extreme movements were done. Only on a few occasions did she get any backache, which was of minor degree and lasted for two or three days, if she "over-did" her movement.

TABLE II.

Distances between Vertebral Bodies (in Millimetres).

(*a*) Anteriorly.

Upper Vertebra of Pair Examined.	Distance with Spine in Standard Position.	Spine in Hyperextension.		Spine in Hyperflexion.	
		Distance.	Amount of Opening-up.	Distance.	Amount of Closing-up.
Thoracic XII ..	9·0	13·0	4·0	8·5	0·5
Lumbar I ..	12·0	16·0	4·0	8·5	3·5
Lumbar II ..	12·5	16·5	4·0	8·5	4·0
Lumbar III ..	13·0	17·0	4·0	10·5	2·5
Lumbar IV ..	14·0	18·5	4·5	12·0	2·0
Lumbar V ..	16·0	26·5	10·5	12·5	3·5

(*b*) Posteriorly.

Upper Vertebra of Pair Examined.	Distance with Spine in Standard Position.	Spine in Hyperextension.		Spine in Hyperflexion.	
		Distance.	Amount of Closing-up.	Distance.	Amount of Opening-up.
Lumbar I ..	9·5	6·5	3·0	10·0	0·5
Lumbar II ..	9·0	7·5	1·5	10·0	1·0
Lumbar III ..	8·0	7·0	1·0	11·5	3·5
Lumbar IV ..	7·5	8·5	−1·0	8·0	0·5

Conclusions from Table II.

Extension.

Bodies:

- Greatest movement occurs anteriorly between body of fifth lumbar vertebra and sacrum.. } Opening up.
- Moderate movement occurs anteriorly between other bodies. } Opening up.
- Very slight movement occurs posteriorly between all bodies except those of fourth and fifth lumbar vertebræ. } Closing up.
- Very slight movement occurs posteriorly between the bodies of the fourth and fifth lumbar vertebræ. } Opening up.

Apophyseal joints:

Joints become V-shaped.

Inferior facets ride lower except those of the fourth lumbar vertebra, which ride higher.

In case of the fourth and fifth lumbar vertebræ, when extension increases after spinous processes impinge, then inferior facets of the fourth lumbar vertebra move upwards.

Flexion.

Bodies:

- Moderate movement occurs anteriorly between all bodies. } Closing up.
- Slight movement occurs posteriorly between all bodies. } Opening up.

Apophyseal joints:

Joints become Λ-shaped.

Inferior facets ride higher.

Flexion is limited considerably in comparison with extension.

In regard to (*a*) (see Table II), Falconer *et alii* (1948) state that in intermittent prolapse there may be no bulging when the patient is relaxed under anæsthesia, and that the disk may be made to protrude at operation by hyperextension of the spine. In extreme hyperextension since there is widening of the vertebræ both anteriorly and posteriorly, the disk volume would be increased and with the negative pressure it would be hard to imagine any protrusion. In the particular radiographs examined, it is doubtful whether in hyperextension at any stage the disk volume would be diminished with consequent indication of positive pressure and protrusion.

The common posture for the initial attack is flexion of the spine; the flexion is often with the body horizontal to the ground surface, and occasionally it is lower. The initial attack may occur before any lift is made, and it is generally accepted, and stressed by Falconer, that senescence of the disk is the significant factor. Apparently, therefore, the posture of full flexion of the spine is consistent with increased disk compression leading to protrusion in the conscious patient. Passive opening up of the vertebral body interspace posteriorly by primary rupture of the *annulus fibrosus* without force from within the disk is remote in view of the strong protective mechanisms against that event. It seems certain that the basic fact determining projection or otherwise is positive or negative pressure in the disk. I discussed this question of posture in relation to the disk with Dr. Gilbert Phillips, whose operative experience indicates that projection does occur in appropriate cases in flexion of the spine under anæsthesia.

From a consideration of this table of spinal movement in relation to disk protrusion, nerve tension, and size and shape of canals, it appears that there is one movement that should be relatively safer than any of the other movements where manipulation might be indicated and where an associated disk lesion is one of the possibilities. This movement is rotation of the lumbar part of the spine towards the side of the doubtful disk lesion. In this movement there is probably no significant effect on the disk protrusion, a slackening of the nerve and probably no significant effect upon the canal. In my experience this relatively safe rotation has the greatest potential of therapeutic effect, and the point arises whether the association is accidental or *propter hoc*.

When manipulation of the spine is indicated I suggest:

1. That no manipulation of the spine be done in the presence of an obvious disk protrusion.

2. That the full routine procedure be not necessarily carried out on all cases.

3. That in the presence of a possible disk protrusion only the relatively safe manœuvre of rotation towards the side of the suspected lesion be performed.

4. That degenerative disk lesions (Hyndman, 1946) offer greater scope than protrusions.

5. That the other spinal manipulative movements be related to the clinical picture of the particular case.

6. That the range of manipulative movement in any case be related to the normal articular range and the range of the particular patient.

7. That partial or complete manipulation may have a place in the post-operative treatment of disk degeneration and protrusion, not accompanied by stabilization, late in the convalescent stage, in those cases of persistent residual symptoms in which there is no reason to suspect a further disk lesion and in which the clinical picture is such that manipulation is indicated. This would appear to be even more rational than pre-operative manipulation since the offending disk has no longer to be considered in aggravation.

Time does not allow discussion of:

1. The low-back braces for residual symptoms, the chief principle being partial immobilization.

2. Epidural injection, which in my hands has been rarely, if ever, curative, sometimes palliative in the acute phase, and occasionally completely successful in clearing minor residual symptoms.

3. The possibilities of fasciotomy.

Summary.

In a consideration of the conservative treatment of the diskogenic syndrome the following matters have been discussed:

1. Some related anatomy and physiology.
2. Some fields of prospective investigation.
3. The rest mechanism of the lower part of the back.
4. The nature of the list and its possible action as a vicious cycle.
5. Types of immobilization, with indications for their application.
6. Indications for manipulation.

References.

Elkin, A. P. (1948), personal communication.

Elliott, Frank (1944), "Tender Muscles in Sciatica", *The Lancet*, Volume I, page 47.

Falconer, M. A., McGeorge, M., and Begg, A. C. (1948), "Surgery of Lumbar Intervertebral Disk Protrusion", *The British Journal of Surgery*, Volume XXXV, page 225.

Gray, Charles (1947), "The Causes and Treatment of Sciatic Pain", *International Abstracts of Surgery*, Volume LXXXV, page 417.

Harmon, J. B. (1948), "The Localization of Deep Pain", *British Medical Journal*, Volume I, page 188.

Hyndman, O. R. (1946), "Pathological Intervertebral Disk and its Consequences", *Archives of Surgery*, Volume LIII, page 247.

Kenny, R. Hamilton (1948), "Investigation into the Anatomy of the Lumbar Spinal Nerves and Intervertebral Canals", in the press.

Lazorthes, G., Poulhes, J., and Espagno, J. (1947), *"Étude sur les nerfs sinuvertébraux lombaires, le nerf de Roofe, existe-t-il?" Comptes rendus de l'Association des anatomistes*, 34th Reunion, Paris, 1947, page 317.

Shellshear, J. L., "The Transverse Process of the Fifth Lumbar Vertebra", in the press.

Spurling, R. G., and Grantham, E. G. (1940), "Neurologic Picture of Herniations of the Nucleus Pulposus in the Lower Part of the Lumbar Region", *Archives of Surgery*, Volume XL, page 375.

Wyke, B. D. (1947), "The Pain Pathway", *Bulletin of the Post-Graduate Committee in Medicine in the University of Sydney*, Volume III, page 1.

CARCINOMA OF THE THYREOID GLAND WITH REPORT OF TWO CASES.

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THE present study of carcinoma of the thyreoid gland was stimulated by the observation of two young male patients over a period of several years, who demonstrated non-papillary types of growth with metastases.

As a prerequisite to discussion of these cases, the definition and correlation of adenoma, carcinoma and nodular goitre are considered appropriate.

Nomenclature.

Some of the conventional terminology of tumours of the thyreoid gland arose at a time when very little of the pathology of these conditions was known or understood.

Wölfer (1880) as early as 1880 postulated that fœtal adenomata were derived from fœtal cell rests, but this theory is no longer generally accepted. G. Crile, junior (1949), points out that "fœtal adenoma" is a histological term which applies to a rather hyperplastic type of cellular arrangement similar to that seen in the thyreoid of a fœtus, and is an unsatisfactory term because a solitary or discrete adenoma may show histologically well-differentiated colloid-filled vesicles, or any intermediate stage of differentiation down to true fœtal type. Lahey (1931) suggests that a more apt and descriptive title for such a single benign tumour is merely "discrete adenoma".

Discrete adenoma then is a clinical entity and implies a tumour which is well circumscribed from the remainder of the gland, its origin being neoplastic rather than physiological, and it may not always be distinguished with certainty on physical signs from carcinoma.

"Benign metastasizing adenomata" have led to a certain amount of confusion in the past. Metastases consisting of apparently normal thyreoid tissue were first described by Conheim, but careful investigation of his report will show clearly that the thyreoid gland was the seat of carcinoma. Ewing (1942) makes the following remark concerning these tumours: "Most metastasising simple [*sic*] adenomas exhibit areas of adeno-carcinoma in some part of the tumour", which, to my way of thinking, is rather contradictory. Adenoma being conceded to denote a benign neoplasm, it can be stated didactically that "benign metastasising adenoma" is a misnomer.

Nodular goitre is a clinical term used by Means (1948) to indicate multiple swellings in the gland, whether neoplastic, areas of fibrosis, cysts, calcification, thyreoiditis or involutional masses.

The relationship of such a gland to carcinoma has been well recognized for a number of years.

Relationship of Adenoma and Carcinoma.

Crile (1949) states that, although the incidence of carcinoma is higher in nodular goitre, it is, however, difficult to prove that carcinomata have their origin in adenomata. In his opinion, it is reasonable to suppose that many, if not most, carcinomata of the thyreoid are carcinomata from the beginning and arise from the parenchyma of the gland as do adenomata. He argues that since we cannot prove that a carcinoma often arises from within the substance of adenoma and since the incidence of carcinoma of the thyreoid is so low, even in the areas where endemic goitre is prevalent, there is little possibility that a given adenoma of the thyreoid will become malignant.

He continues his argument with the statement that there is less chance that an adenoma of the thyreoid will become malignant at some future date, than that carcinoma will develop in an apparently healthy breast or uterus.

As supportive evidence he quotes the figures of Pack and Ward, who show statistically that carcinoma of the breast is ten times more common than carcinoma of the thyreoid.

Cole *et alii* (1945) and Pemberton (1939) have pointed out that it is impossible to arrive at an accurate estimate of the relationship of adenoma to carcinoma, largely because the malignant tumour may overgrow the site of origin and thereby make it impossible to identify the primary lesion of the carcinoma.

Academic argument of this relationship should therefore give way to the test of clinical experience.

Since it has been recognized that certain solitary adenomata cannot be differentiated clinically from an early carcinoma, and some adenomata will unpredictably undergo carcinomatous changes, many surgeons, particularly those well experienced in thyreoid surgery, advocate surgical intervention in all patients found to have a discrete adenoma of the thyreoid. This has been the practice of H. R. G. Poate (1949) for fifteen years and of J. H. Means (1948) for the past four years.

The figures of Cole, Slaughter and Rossiter (1945), who working in Chicago (a goitrous area), encountered cancer of the thyreoid in 24% of 92 solitary nodules, and of Soley (1947), who found cancer in 20% of 95 discrete nodular goitres, are in accord with those of Crile (1949), who found 24·5% of malignancy in 98 solitary tumours of the thyreoid gland. The above figures undoubtedly justify an active surgical policy.

With regard to the potential dangers of adenoma of the thyreoid, Poate (1936) reached *inter alia* the following conclusions:

> Clinicians should carefully avoid the prefix of "simple" or "benign" with regard to tumours of this gland, even if they are thought to be non-malignant.
>
> Adenomata or their variations, for example, fibro-adenomata, cysto-adenomata or mixed adenomata, are potential foci upon which carcinomatous or other malignant metamorphosis may occur.

It is our duty to our patients to warn them of the possible danger of leaving such tumours, and to advise them, if they are young, to have the tumour removed before they reach the danger age of twenty-five years; if they are beyond this age when the tumour develops, we should advise them to submit to operation without undue delay.

In my experience thyreoid adenoma has more chance of harming the individual than any other type of "simple" growth.

Accessory or Aberrant Thyreoids.

It is recognized that certain carcinomata of the thyreoid may give rise to metastases which paradoxically produce the histological picture of normal glandular tissue. When the secondary growth is localized to the cervical lymph nodes, this may be easily confused with aberrant thyreoid tissue.

Crile believes "lateral aberrant thyreoid" and cervical metastases (from a papillary carcinoma) to be homogeneous.

There is little doubt that accessory or aberrant thyreoids sometimes occur in situations remote from the rudimentary thyreoglossal duct, and Dunhill has observed a relationship between such ectopic tissue and carcinoma.

Dunhill (1931) has stated that "carcinoma occurs in these aberrant thyreoids (at a youthful age) with such consistency, that the possessor of such a misplaced portion of thyreoid tissue is doomed, from birth to death, from carcinoma of the aberrant thyreoid".

Histological Diagnosis of Carcinoma.

Carcinoma of the thyreoid gland frequently presents interesting problems to the pathologist, who may have great difficulty in arriving at a definite diagnosis in the absence of metastases. Instances have occurred in which different sections taken from the same gland have shown ordinary epithelial hyperplasia, adenocarcinoma, a picture of colloid goitre and medullary carcinoma. In all suspected cases of carcinoma of the thyreoid gland numerous sections are therefore advisable. When making a diagnosis of malignant disease the pathologist is accustomed to rely on such histological criteria as: (i) evidence of rapid growth, as indicated by large numbers of mitotic figures (this is by no means pathognomonic); (ii) the atypical nature and lack of differentiation of individual cells and cell grouping; (iii) invasive growth, especially invasion of blood vessels.

This last observation, as proposed by Graham (1924), is the only certain histological criterion of malignant disease of the thyreoid in the absence of secondary glandular involvement. T. B. Mallory required the penetration of a blood vessel large enough to possess musculature, with actual extension of the tumour cells through the muscle fibres, to be demonstrable.

Classification.

Clinically and pathologically malignant neoplasms of the thyreoid gland do not appear to follow the usual rules. The less differentiated tumours are not necessarily the most malignant nor need they be most responsive to irradiation. The converse is equally true. Certain totally undifferentiated adenocarcinomata, highly malignant under the microscope, may metastasize late, while others far more differentiated may be found to metastasize early.

Twenty-five years ago Graham and Warren recognized that there were fundamental clinical differences between papillary and non-papillary growths of the thyreoid, but Graham called the non-papillary carcinomata "malignant adenomas".

Within the papillary group there were observed two distinct types. Some tumours were characteristically small and frequently discovered only from the occurrence of metastatic regional lymph glands. The other type was characterized by larger and proliferative tumours, which may have been present for years prior to secondary glandular involvement. These papillary tumours usually occur in children or young adults, and secondary spread via lymphatics may be very late. The prognosis in these cases is good if the tumours are totally removable.

The non-papillary carcinomata most frequently arise in nodular goitre and occur usually in the cancer age. Hæmatogenous spread precedes lymphatic glandular involvement and this latter occurrence is considered to denote incurability. Prognosis in this group is fair to poor and depends upon the degree of anaplasia of the primary tumour.

Although recognition of these clinical groups is not always practicable. Graham's classification of the majority of thyreoid carcinomata into (*a*) papillary and (*b*) non-papillary groups appears to be of some clinical value. Crile believes that when papillary and non-papillary areas exist in the one tumour and there is demonstrable invasion of blood vessels, the tumour, since it would behave as a non-papillary carcinoma, should be classified accordingly.

Reports of Cases.

CASE I.—A single man, aged twenty-three years, was admitted to the Repatriation General Hospital, Concord, on August 1, 1947, with the following complaints: (i) swelling of his neck, and burning sensation in the throat, for four months; (ii) increasing fatigue.

It was learned that he was discharged from the army fit in October, 1946, and had remained well until April, 1947. He had not lost weight. Appetite was fair only and he had a slight unproductive cough. There were not any symptoms suggestive of thyreotoxicosis and nothing relevant in his previous medical history, nor was there a family incidence of goitre. The patient was born at Walla Walla, near Albury, and excepting for army service had lived for twenty years at Canberra (a goitrous area). His present occupation was that of carpenter.

On his admission to hospital a large asymmetrical tumour of the thyreoid gland was noted, mainly in the right lobe. It was firm, non-tender and smooth, and moved on deglutition. There were no palpable lymph glands in the neck. Early clubbing of the fingers was the only other abnormality detected clinically. The provisional diagnosis was adenoma of the thyreoid.

Immediate investigation revealed a basal metabolic rate of +8%, a body weight of 128 pounds and a normal blood picture.

The report on X-ray examination of the chest was as follows: "There are some ill-defined areas of consolidation in the lower lobes, especially the right." The radiologist suggested that tuberculosis should be excluded. Three subsequent sputum examinations revealed no tubercle bacillus; culture was not attempted.

After consultation, Dr. F. W. Niesche performed subtotal thyreoidectomy on September 25, 1947. The findings at operation were unexpected. The gland was extremely difficult to mobilize owing to capsular adhesions, and much dissection of the gland particularly from the trachea was necessary. All the right lobe and most of the left were involved by neoplasm; a small portion only of the left lobe which appeared to be normal thyreoid tissue was left behind. No enlarged lymph glands were seen. The surgeon's opinion at the time was that the condition was probably malignant. Convalescence was uneventful.

Pathological Report.

The pathological report received read as follows:

> The thyreoid gland is enlarged and the capsule is increased in thickness. The thyreoid tissue has been almost entirely replaced by a large tumour of firm consistence. The growth is sharply demarcated from the thyreoid tissue, which has been so thinned out that it forms a mere shell for the tumour. The cut surface shows the substance of the tumour to be solid and opaque. There is a lobulated appearance due to strands of connective tissue traversing its substance. Several small nodules of tumour tissue also project from the surface of the thyreoid gland. One small lymph node is attached to the outer surface of the thyreoid gland.
>
> *Microscopic.*—Many sections have been examined and in each the structure is that of a spheroidal-cell *carcinoma simplex*. The cells are arranged in solid sheets and trabeculæ and in some areas there is an attempt at glandular formation. No colloid is present. Mitoses are infrequent. The stroma is scanty. There is invasion of vascular channels and the surrounding thyreoid tissue is infiltrated by the tumour. The lymph node is involved. The tumour cells have undergone some differentiation and show a glandular structure. In one part the appearance is that of relatively normal thyreoid tissue.

Prior to the patient's discharge from hospital on December 12, 1947, a further X-ray examination of the chest showed no change since the first film, but the radiologist stated that the areas of consolidation seen in both films could be metastatic nodules. A three-week course of deep X-ray therapy was given to the neck and chest. The patient's basal metabolic rate was −20%; his weight was 134 pounds. He was instructed to report for review in three months' time and to continue on the maintenance dose of *Thyroideum Siccum* one grain twice a day.

In February, 1948, the patient's condition was reviewed. There were no signs of local recurrence in the neck, the basal metabolic rate was −16%, and the weight was 136 pounds. A report on X-ray examination of the chest stated that the findings were unchanged. A further course of deep X-ray therapy was given to the neck. At the time of this review inquiries were made regarding the use of radioactive iodine to test metastatic pick-up, but none was available. The patient was discharged from hospital in April on a maintenance dose of *Thyroideum Siccum* one grain three times a day.

In August, 1948, the patient reported that he had noticed a lump in his left thigh for the past three weeks. The histopathological report after excision of the nodule from the patient's left quadriceps was as follows:

> The histological picture is similar to that of the primary growth. The tumour cells are arranged in solid masses, but there is a greater tendency to glandular formation. There is extension of the tumour between muscle fibres and there is also involvement of thin-walled vascular channels. No colloid is present.

The patient's basal metabolic rate was +1% and his weight was 125 pounds. There was no change in the radiological appearances of his chest.

In December, 1948, examination revealed no recurrences in neck or thigh. The radiologist reported as follows: "Small increase in number of deposits in the lung, now definitely regarded as metastases." The patient's weight was 128·5 pounds.

In March, 1949, it was found that a further nodule had appeared lower down in the left thigh. After its excision, microscopic examination of this tumour showed metastatic carcinoma. The pathologist stated: "Further differentiation is evident and glandular destruction is a prominent feature." At the time of this review it was observed that the clubbing of the fingers was marked and similar changes had occurred in the toes. A basal metabolic rate of −8% followed cessation of administration of the thyreoid extract for four weeks. The patient's weight was 127 pounds. X-ray examination of the chest revealed an increase in the size of the secondary deposits since the previous examination.

A further course of deep X-ray therapy was given to the chest in April.

On May 3, 1949, X-ray examination of the left femur revealed areas of lacy periostitis, which were first considered to be consistent with metastatic involvement within the periosteum itself, or of the outer shell of the cortex. While still in hospital the patient complained of aching in the left forearm and lower part of the leg; there was a palpable swelling over the left ulna. Further X-ray examinations of all bones on June 7, 1949, revealed that the periosteal reaction and the lacy new-bone formation were general and symmetrical in the long bones and even involved the metacarpals. In addition no metastatic deposits could be seen in the substance of either long or flat bones. After discussion with the radiologist, the conclusion was reached that the bony changes, in view of the associated clubbing and the long-standing chest metastases, must be due to hypertrophic pulmonary osteoarthropathy.

When the patient was last examined on July 21, 1949, there were several nodules palpable in both posterior triangles of the neck. Some were subcutaneous and others appeared to be due to involvement of deep cervical lymph glands. The report of X-ray examination of the chest was as follows: "Further secondary deposits are seen in the lungs. The appearances are worse." The patient's weight was 124·5 pounds.

Although this carcinoma is now considered to be fulminating the patient's general condition has remained good. However, the occurrence of further metastases, both lymphatic and hæmatogenous, is in accordance with the degree of malignancy of the original thyreoid tumour.

Comment.

The features of this case which will receive mention in the discussion are as follows: (i) non-papillary carcinoma of the thyreoid gland, with early metastases not diagnosed until operation; (ii) the progression of lung metastases in spite of deep X-ray therapy; (iii) hypertrophic pulmonary osteoarthropathy complicating the clinical picture; (iv) a known hæmatogenous spread to the lungs of almost two years' duration with spread to the soft tissues. Lately there has been a more rapid progression of the metastatic spread with glandular involvement.

Case II.—A boy, aged twelve years, was admitted to Sydney Hospital in September, 1942, under the care of Dr. R. J. W. Malcolm with a history of three lumps in his neck for the past nine months. Biopsy of one of these lymph glands was obtained, and the report was that it consisted of large alveolar masses of malignant new growth which appeared to be of epithelial origin. Although the tumour lacked differentiation, the presence of some ill-defined prickle cells seemed to indicate that it had arisen from stratified squamous epithelium. There was, of course, no means of determining whether the site of origin was in an anatomical structure normally covered by such epithelium, such as a branchial remnant, or in an area of metaplasia within the thyreoid gland or in the lower part of the respiratory tract. No tumour of the thyreoid gland was palpable and the diagnosis of secondary adenocarcinoma was made. A course of deep X-ray therapy was given to the region of the neck.

In March, 1943, the patient was readmitted to hospital for excision of the remainder of the enlarged glands in the neck. The pathologist on this occasion reported that the most likely site of origin was a primary tumour in the lung or in the upper part of the respiratory tract including the accessory nasal sinuses. Investigation by the ear, nose and throat surgeon followed with diagnostic tonsillectomy, but no primary tumour was found.

When the patient was readmitted to hospital in August, 1943, bilateral involvement of the lymph glands in the anterior triangles of the neck was noted. Exploration of the thyreoid gland was performed by Dr. Malcolm, and the left lobe being slightly enlarged, left hemithyreoidectomy was carried out. Microscopically the structure of the tumour of the left lobe was the same as that seen in the cervical node in September, 1942.

Between 1943 and June, 1948, further regional lymph glands were involved, in spite of repeated deep X-ray therapy during this period.

In June, 1948, local recurrence of the primary tumour was found to have occurred, and the mass was completely excised. It was of interest to note that the histological report on this occasion stated that invasion of veins by carcinoma cells had been observed. Later in 1948 the patient, who had been employed as a plumber's assistant, developed intractable chemical dermatitis and committed suicide.

The patient was considered to be suffering from a non-papillary adenocarcinoma with cervical metastases.

Comment.

The points to be noted in this case are as follows. (i) Difficulty was experienced in finding the primary carcinoma and in establishing a diagnosis. (ii) After six years there was no evidence of spread of metastases further than the cervical lymph glands. (iii) This patient developed carcinoma of the thyreoid probably before puberty. There was normal physical development and no signs of hypothyreoidism. (iv) The immediate prognosis for this patient was almost certainly good. His future would probably have been determined by the operability of the growths in further recurrences.

Discussion.

Pre-operative Diagnosis.

The question of pre-operative diagnosis of primary thyreoid malignant disease in the absence of metastases is often as difficult for the pathologist as for the surgeon. Many of these small tumours are not diagnosed until operation, for the pathologist's report on biopsy or autopsy may be the first indication to the surgeon that he is dealing with such a condition. Although carcinoma of the thyreoid is not a common disease, there seems to be little doubt that it occurs more frequently than is realized and is responsible for some of the deaths from metastases of unknown origin.

Through the courtesy of Sydney Hospital the following information of interest has been obtained. Since 1922, 34 patients with carcinoma of the thyreoid have been

admitted to Sydney Hospital, and as the majority of their growths were inoperable they received palliative treatment only. During the period 1938 to 1948 twelve patients were admitted; seven of these presented with large inoperable tumours and metastases, in three other cases the condition was not diagnosed until operation, and in two cases the condition was not suspected, but was diagnosed histologically after operation.

Age of the Patients.

Carcinoma of the thyreoid is not necessarily a disease of the elderly. In Crile's series, 25% of papillary carcinomata appeared before the age of twenty years and the average age of patients with non-papillary carcinoma of the thyreoid was fifty-one years; the youngest was eighteen and the oldest seventy-five years. Both cases in this report are unusual then in respect of age and subsequent course.

Osteoarthropathy.

The occurrence of osteoarthropathy in Case I was manifested by the clubbing of the fingers at the time of the first admission, with later development of the characteristic "parrot beak" deformity of the nails and well-marked periostitis in all long bones twenty months later. Thus evidence is provided that the primary carcinoma of the thyreoid gland may possibly have been present for a longer period than was suspected.

Although osteoarthropathy has occurred from extra-pulmonary causes, such as ulcerative colitis and *polyposis coli*, it is, however, more commonly found associated with congenital heart disease and certain pulmonary conditions (infection and tumours) of long standing.

It seems reasonable to presume in this case that it was incidental to metastatic deposits in the lungs from a primary thyreoid cancer.

Deep X-Ray Therapy.

X-ray therapy did not effect much regression or even appear to control the metastases in either of these two cases under review. Although correctly filtered X-ray therapy has produced dramatic primary regression with resultant control for many years in some tumours of the thyreoid, it is possible that some of the reports of radiosensitivity of the papillary carcinomata of the thyreoid may be based on the natural slowness of these types of growth. Generally in all post-operative cases deep X-ray therapy is advised, but there is a growing tendency in some clinics to treat only selected patients with this type of therapy. The argument in favour of withholding X radiation is that if local disease does recur it may be best treated by further surgery.

Radioactive Iodine.

Treatment of thyreoid cancer with radioactive iodine is still in the experimental stage and most of the results have been disappointing. The primary question to be decided if this form of treatment is entertained is the selective pick-up of the isotope by the tumour cells.

Siedlin, Marinelli and Oshry (1946) had the opportunity of studying a patient who developed thyreotoxicosis, which had arisen from a widely metastasizing, hyperfunctioning cancer of the thyreoid. Radioactive iodine administered to this patient was retained by all the known metastases in concentrations great enough to warrant administration of this agent in therapeutic amounts. Subjective and objective improvement followed intensive therapy with radioactive iodine.

Another case has been reported from the Montefiore Hospital, New York, where a total thyreoidectomy had been performed for carcinoma with thyreotoxicosis. The toxic symptoms persisted post-operatively, and after radioactive iodine administration many more metastases than were demonstrable radiologically were detected with a Geiger counter.

Conclusion.

Most of the carcinomata of the thyreoid which are not suspected or diagnosed before operation are of the slow growing, highly differentiated type and are usually curable. Many of the undifferentiated cancers are incurable, regardless of how early they are removed, because hæmatogenous metastatic spread has invariably occurred. It is most unlikely, therefore, that earlier recognition and total thyreoidectomy would alter the prognosis in more than a small percentage of cases.

It is generally agreed that at least 1% of adenomata ultimately become carcinomatous, and, if we consider carcinoma of the thyreoid as a whole, collected statistics show that 87% to 90% of malignant conditions are associated with adenoma.

It is apparent, therefore, that at the present time prophylactic surgery will do most to lower the morbidity from thyreoid cancer.

Poate (1938) emphasizes the fact that "the lesson to be learned is that any adenoma definitely palpable should be removed irrespective of the age of the individual, unless he is very young or very old". In all cases the surgeon should remember to "examine both lobes of the gland, as often there may be one or more nodules not evident from an external examination and usually set well back in the lower pole, or possibly intrathoracic".

Summary.

1. The pathology of certain tumours of the thyreoid gland is considered.

2. Discussion follows on the relationship of adenoma to carcinoma of the thyreoid.

3. Two cases demonstrating non-papillary carcinoma are reported.

4. Mention is made of the finding of hypertrophic pulmonary osteoarthropathy incidental to pulmonary metastases in one case.

5. The place of deep X-ray therapy, radioactive iodine and surgery in treatment is mentioned.

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References.

Cole, W. H., Slaughter, D. P., and Rossiter, L. T. (1945), "Potential Dangers of Non Toxic Nodular Goitre", *The Journal of the American Medical Association*, Volume CXXVII, page 883.

Crile, G., junior (1949), "Practical Aspects of Thyroid Disease", Chapter II, page 185, and Chapter XXIII.

Dunhill, T. P. (1931), "Carcinoma of the Thyroid Gland", *The British Journal of Surgery*, Volume XIX, page 83.

Ewing, J. (1942), "Neoplastic Diseases", Fourth Edition, page 504.

Graham, A. (1924), "Malignant Epithelial Tumours of the Thyroid", *Surgery, Gynecology and Obstetrics*, Volume XXXIX, page 781.

Lahey, F. H. (1931), "Apathetic Thyroidism", *Annals of Surgery*, Volume XCIII, pages 1026 and 1030.

Means, J. H. (1948), "The Thyroid and its Diseases", page 453.

Pemberton, J. (1939), "Malignant Lesions of the Thyroid Gland: Review of 777 Cases", *Surgery, Gynecology and Obstetrics*, Volume LXIX, page 417.

Poate, H. R. G. (1936), "Some Surgical Aspects of the Goitre Problem", The Medical Journal of Australia, Volume I, page 843; (1938), "The Present Position of Surgery of the Thyreoid", The Medical Journal of Australia, Volume II, page 635; (1949), personal communication.

Poate, H. R. G., and Macindoe, P. H. (1940), "Recurrent Adenomata of the Thyreoid", The Medical Journal of Australia, Volume I, page 187.

Siedlin, S. M., Marinelli, L. D., and Oshry, E. (1946), "Radioactive Iodine Therapy: Effect on Functioning Metastases of Adenocarcinoma of the Thyroid", *The Journal of the American Medical Association*, Volume CXXXII, page 838.

Wölfer (1880), *"Ueber die Entwicklung und den Bau der Schilddrüse mit Rücksicht auf die Entwicklung der Kröpfe".*

Addendum.

Since submission of this article for publication, Case I has been reviewed again (on September 16, 1949). When the patient was examined the metastatic lymph glands in the posterior triangles of the neck had increased in size and there had been an extension to the left pectoral group.

TWO CASES OF SEVERE PYLORIC OBSTRUCTION IN INFANTS WITH COMPLETE ABSENCE OF PYLORIC HYPERTROPHY, WITH NOTES ON THE INDICATIONS FOR THE RAMMSTEDT OPERATION.

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Case I.

The first patient, a white male baby, was born on August 2, 1948, when he weighed four pounds eight and a half ounces and showed some signs of prematurity. He was fed three-hourly, and took his feeds fairly well, though vomiting a little after each. On the fourth day he weighed four pounds six ounces. On August 10 he vomited all his feeds and appeared to have colic. Peristaltic waves were observed by his medical attendant, and then he was given 16 minims of "Eumydrin", presumably of one in 10,000 aqueous solution, twenty minutes before each hourly feed of three-quarters of an ounce of expressed breast milk.

The baby's condition improved at first, but after a day he vomited more copiously so that early dehydration ensued. The bowels opened occasionally, then after a two-day period of constipation he passed on August 12 a soft yellow motion. On that date he was admitted to the Brisbane Children's Hospital under the care of one of the senior visiting physicians. He weighed four pounds eight ounces and was regarded as a slightly premature baby. No pyloric tumour was palpable, and as he was so young it was considered unlikely that this was a case of hypertrophic pyloric stenosis. He was fed on expressed breast milk, of which he would take one and a half ounces every three hours, with 1·5 millilitres of one in 10,000 "Eumydrin" solution in each feed.

On August 13 he vomited three times, having retained approximately eight and a half ounces in the twenty-four hours. His weight fell to four pounds five ounces.

For several days this degree of vomiting continued, so that on August 16 the dose of "Eumydrin" was raised to three millilitres without beneficial results. Refeeding after vomiting was futile, the second feed being promptly returned.

On August 18 the vomiting was projectile in character, and only six ounces of milk were retained in twenty-four hours. On this day a barium meal was given. A skiagram taken at two hours showed that about 10% of the meal had passed the pylorus, and another taken at six hours showed half the meal still in the stomach, and the remainder passing uneventfully along the intestines. As dehydration was now evident and the weight had fallen to four pounds three ounces, the intravenous drip administration of saline was commenced, half-strength physiological saline with 5% glucose being given at the rate of 20 millilitres per hour. In addition 100 millilitres of "Parenamine" containing 15 grammes of amino acids were added daily to the intravenous drip fluid container. This intravenous infusion ran for two days, during which time oral feeds were continued with "Eumydrin". Vomiting occurred, but to a less extent than formerly. The dehydration was overcome and the patient's weight rose to four pounds nine ounces.

On August 21 vomiting took place after every feed, so the dose of "Eumydrin" was increased to four millilitres. On August 22 the temperature rose to 100° F. and dry rhonchi were heard in the chest. This condition settled down in twenty-four hours under the influence of penicillin, 3000 units being given intramuscularly every three hours.

Vomiting continued, so that by August 25 the weight had fallen to four pounds seven ounces and dehydration was again present. A second intravenous drip infusion was commenced. A third was commenced on August 27.

At this stage it was felt that medical treatment had been given a fair trial, and one of the visiting surgeons agreed to perform a laparotomy. Accordingly, on August 27 this was done and the findings were as follows: (i) A small amount of free serous fluid was present in the peritoneal cavity. (ii) The whole of the small intestines showed active peristalsis. (iii) No section of the bowel showed any gross distension or collapse. (iv) Gas and fæcal material were present in the descending colon. (v) The pylorus appeared to be normal. After inspection the viscera were merely returned and the abdomen was sutured.

On August 30, after a medical consultation, higher doses of "Eumydrin" were used, up to five drops of 0·6% alcoholic solution of "Eumydrin" together with one-eighth of a grain of phenobarbital, but without effect. The serum protein level on August 31 was 4·8 milligrammes per 100 millilitres. His temperature rose to 100° F.

On September 1 dehydration was again present, so the baby's fourth intravenous infusion was commenced. In this were given 45 millilitres of human serum. In spite of this, however, his condition deteriorated, and towards noon on September 2 he collapsed. He died in spite of all restorative procedures at 3 p.m.

An autopsy performed on the following day revealed the following findings. Practically the whole of both lungs were solid with congestion. The heart was normal, the *foramen ovale* and *ductus arteriosus* being closed. The liver was normal in colour and consistency. The kidneys were both normal. There was absolutely no pyloric hypertrophy, obstruction or inflammation. The stomach and intestines were normal. The suprarenals were both normal. The brain appeared to be normal and showed no signs consistent with a possible central nervous cause of the persistent vomiting.

The immediate cause of death, bronchopneumonia, was evident. The cause of the vomiting and pyloric obstruction was considered to be pylorospasm, strange though this appeared in the presence of rather an atrophic pylorus.

Case II.

The second patient, a white male baby, aged three weeks, was admitted to the Brisbane Children's Hospital on September 21, 1948, with the following history. The child had had a normal birth; he was the fourth child, but the first male child, of normal parents, there being no unusual obstetric history. His birth weight was seven pounds eight ounces. No abnormalities were detected at birth. He vomited some of his feeds prior to his discharge from the obstetric hospital, but was well on his discharge and retained full breast feeds. His weight on the tenth day after birth was six pounds fifteen ounces. He was well for four days after his discharge from hospital (that is, until he was fourteen days old), when he again commenced vomiting some of his feeds. The mother noticed that one lot of vomitus contained bile, but she could not recall noting this in any subsequent vomitus.

The patient was given 15 drops of "Eumydrin" before each feed, but he still continued to vomit all of some feeds, although he appeared to retain all of other feeds. At this stage the vomiting was not projectile in character. During this period the infant was passing two to three green, non-offensive bowel motions daily. He did not appear to have colic at any time, nor did he break excessive wind after feeding. He did not, except for his vomiting and failure to gain in weight, appear any more difficult to manage than his elder sisters at the same age.

On his admission to hospital his weight was six pounds four ounces. He had slight nasal discharge, but otherwise appeared normal except for his weight. No abdominal peristalsis could be detected and no tumour could be palpated. The vomiting was not projectile. On September 22, the day after his admission, he took the 6 a.m. and 9 a.m. feeds (two ounces only) and the abdomen was then noticed to be distended. Feeding was then changed to the administration of expressed breast milk every three hours, and gastric lavage was commenced half an hour before each feed. From this it became evident that there was a large gastric residue two and a half hours after a feed although the same number of small green bowel motions continued to be passed. No bile was noted in the stomach washings. The administration of three millilitres of a one in 10,000 aqueous solution of "Eumydrin" was commenced twenty minutes before each feed.

On the second day after his admission to hospital the baby appeared hungry and took his feeds well. There was early evidence of dehydration, and it appeared that little if any fluid was passing the pylorus. No abdominal tumour or peristalsis could be felt. The bowel motions ceased. Earlier culture of stools gave a negative result for pathogenic bacteria. Feeding was ceased and fluid and electrolytes were given by the intravenous route at the rate of 25 millilitres per hour.

A barium meal was given and examination revealed a small stomach; serial skiagrams indicated that "up to seven hours none of the meal had passed the pylorus".

On the third hospital day feeding was recommenced, and five millilitres of "Eumydrin" were given twenty minutes before each feed. Vomiting, which now appeared to be more projectile in character, occurred after each feed—the vomitus being the return of the feed given, unaltered.

Early on the fifth hospital day slight peristalsis was thought to be present, but no tumour could be felt. As the infant was well hydrated, the intravenous drip infusion was still running, and the blood picture was normal, laparotomy was undertaken immediately. The findings were as follows: "All abdominal viscera, including the pylorus, appeared normal. There was no pyloric tumour." However in view of the fatal outcome in the first case quoted, it was decided to split the pylorus muscle as is done in the Rammstedt operation, and the abdomen was then closed.

The intravenous drip infusion was continued for a period of twenty-four hours. One hundred millilitres of casein hydrolysate were given intravenously during this period. There was some post-operative vomiting, and continuous gastric aspiration was instituted. At the end of thirty-six hours aspiration ceased and graded feeding was commenced.

From then on the infant progressed steadily, normal bowel motions commenced, and he was discharged from hospital on October 10, weighing six pounds eleven ounces; he was breast fed, and "Vi-lactogen" (three ounces every three hours) was given as a complement.

Comments on the Indications for the Rammstedt Operation.

When the cardinal signs of congenital hypertrophic pyloric stenosis—namely, projectile vomiting of a baby about three weeks old, peristaltic gastric waves and a palpable pyloric tumour—are present, the diagnosis and treatment present little difficulty. At this hospital a Rammstedt operation is performed immediately after some twenty-four hours of intravenous therapy has reestablished water and electrolyte balance upset by the repeated vomiting. We have had no success with "Eumydrin", even in heavy doses, in such cases of undoubted pyloric hypertrophy.

On the other hand, we have both treated successfully by medical means numerous patients with similar symptoms, but in whom no pyloric tumour can be palpated. Presumably these are subjects of pylorospasm, and they need only careful attention to diet and the administration of "Eumydrin" for some weeks, after which the dose can be lessened and finally suspended. Such clear-cut cases of pylorospasm are well described by Sheldon as follows:

> Pylorospasm is more common in female infants. The symptoms begin at about the same time as in Hypertrophic Stenosis, and include forcible vomiting and often constipation. Gastric peristalsis may also be made out. In pylorospasm however there is no hypertrophy of the pylorus, and consequently no tumour to be felt, and herein lies the one important distinguishing feature which determines not only the diagnosis, but also the treatment. In pylorospasm there is no indication for operation.

Naturally there are cases intermediate between true hypertrophic pyloric stenosis and true pylorospasm. These usually amount to the presence of a small degree of pyloric hypertrophy, which produces a tumour so small as to be impalpable to all except him who can feel phantom tumours in any abdomen in which he believes they should be present. These cases usually result in the performance of a Rammstedt operation after medical treatment has failed, and the surgeon is relieved to find a small pyloric tumour to justify his intervention, and operation promotes a cure.

The two cases described in detail appear to us to be important, because it seems that intractable pyloric obstruction can occur in the absence of any pyloric tumour whatsoever, and that if medical treatment has failed a Rammstedt operation should be performed, even though the operation appears at first sight to be a mere gesture to a pylorus so eminently anatomically normal.

Summary.

Two almost identical cases are reported of severe pyloric obstruction in infants, in whom the pylorus was found to be anatomically normal. One of these was treated medically and only inspected surgically; he died. The other patient was subjected to a Rammstedt operation on his seemingly normal pylorus, and he made a good recovery. The conclusion suggested is that such an operation should be performed on any baby with symptoms of pyloric obstruction if medical treatment has failed, even though the pylorus appears to be outwardly normal.

Reviews.

A TEXT-BOOK OF DERMATOLOGY.

ANY publication from the pen of the Suttons commands the attention of dermatologists the world over. The recently published "Handbook of Diseases of the Skin" has been compiled by the younger Sutton, with the elder co-author acting in an advisory capacity.[1]

The book is of 749 pages, attractively bound and printed and generously illustrated with many excellent photographs. The text is well supplied with references, placed adjacent to the statement to which they refer—a method which commends itself to the reader. The index is full and a source of ready information.

It is refreshing to find the authors' own opinions so freely expressed throughout the text, and we feel that much benefit would be derived if this practice was more extensively used by other writers to the exclusion of an accumulation of detail, often contradictory, from the literature.

The classification of the chapters with ætiology as the principal guide is welcome, and should lead to a better concept of diseases of the skin amongst non-specialists. That section devoted to contact dermatitis is handled with realism, and, if the methods of treatment recommended by the authors were more widely adopted, greater success would be achieved in the management of this very common condition.

The chapter headed "Dermal Manifestations of Malformation and Neoplasia" is worthy of close attention, although few Australian dermatologists will agree with the statements made under ætiology of cutaneous carcinoma that: "The role of chronic irritation, once considered paramount, is open to question, and the part played by trauma, is dubious."

This publication has been read with great pleasure, and is recommended to dermatologists as a concise and up-to-date summary of their speciality, and to general practitioners as a well-indexed and useful reference volume. It is considered too advanced for the average medical student.

A TEXT-BOOK OF MIDWIFERY.

THE fact that Wilfred Shaw's "Textbook of Midwifery" has reached its third edition in six years is sufficient evidence of its quality.[2] New material has been added, and parts have been omitted, so that in its six hundred pages a relatively large amount of matter is presented. One cannot but appreciate the concise style and objective approach to this branch of medical activities which calls for clinical judgement, dexterity and operative skill of the highest order. A clear statement of the reasons for delivery in the left lateral position is set out, as well as the advantages of the dorsal position in selected cases. Barrier nursing and isolation in separate wards for patients suffering from puerperal sepsis are described and correlated. The author insists that equally meticulous asepsis must be maintained in the delivery room as in the operating theatre. Ideally, every woman who has had any interference during labour, should be isolated for four days, or "barrier nursed". Trial labour requires most careful supervision and the decision to terminate it calls for experience, judgement and moral courage; above all, observation of the fœtal heart sounds during the second stage is of primary importance. The decision to perform Cæsarean section should be ostponed until the membranes have ruptured. Some may be inclined to disagree with the author's interdict upon vaginal examination during trial labour. The information to be obtained by radiological examination is concisely set out with due regard to its limitations on account of the difficulties of taking accurately standardized films and their interpretation. Brief but comprehensive discussion of pregnancy complicated by maternal disease such as heart conditions, tuberculosis, nephritis and diabetes serves to guide the practitioner whose duty it is to decide such cases. Since the reduction of sepsis by modern technique, heart disease accounts for

[1] "Handbook of Diseases of the Skin", by Richard L. Sutton, M.D., and Richard L. Sutton, junior, M.D.; 1949. St. Louis: The C. V. Mosby Company. Melbourne: W. Ramsay (Surgical) Proprietary, Limited. 9" x 6", pp. 772, with 1057 illustrations. Price: £4 14s.

[2] "Textbook of Midwifery", by Wilfred Shaw, M.A., M.D. (Cantab.), F.R.C.S. (England), F.R.C.O.G.; Third Edition; 1949. London: J. and A. Churchill, Limited. 8¼" x 5¼", pp. 468, with 239 illustrations. Price: 22s. 6d.

16% of maternal deaths, and this fact alone shows the grave responsibility of medical men who advise the would-be or expectant mother in risking pregnancy. One would prefer a more detailed account of the indications and contraindications for using ergometrine by the intravenous route at the appropriate time after the birth of the fœtus in prolonged labour, to prevent threatened post-partum hæmorrhage; furthermore the book still retains an account of packing the uterus in this catastrophe, surely an obsolete method. In spite of its brevity, the introduction to the original edition is a masterpiece of objective statement on the importance of the urge to reproduce and its application to medical and social questions. The book is singularly free from dogmatism and pedantry, and reflects the broadness of outlook of the author. It is brief but comprehensive, well illustrated and most valuable to practitioners as well as students.

MICROBIOLOGY AND MAN.

Birkeland's book, "Microbiology and Man", is written for students seeking a general knowledge of microbiology.[1] In 496 pages the author attempts to give information on fundamentals of microbiology, infection and resistance, common infectious diseases, the microbiology of air, food, milk, water, sewage and soils and on the aspects of bacterial warfare. Bacterial and virus infections only are considered apart from a few intestinal parasites which are mentioned in the chapter on the microbiology of food. The volume concludes with a glossary of scientific terms and a list of references intended to facilitate further study.

A more widespread knowledge of the importance of micro-organisms would be eminently desirable in many professions, especially in persons who occupy executive positions in factories, business, and civil and armed services. Dr. Birkeland's book is well suited to give pertinent information. That in a short description of the main aspects of microbiology the purely technical questions have been given preference and that epidemiology, history and non-medical microbiology have been severely condensed is understandable and cannot be considered as a disadvantage. A better rounding off could perhaps be obtained by the inclusion of some of the most important protozoal and helminthic diseases of man and a short description of contagious diseases of domestic animals and plants.

THE EPIDEMIOLOGY OF THE HÆMOLYTIC STREPTOCOCCUS.

In 215 pages A. F. Coburg and D. C. Young report epidemiological investigations carried out in United States naval establishments during the war.[2]

A total of three million men passed through these centres and streptococcal diseases were the most numerous and important infections encountered. Of scarlet fever 59,458 cases and of rheumatic fever 21,209 cases were reported. These, together with milder infections, resulted in 8089 cases of valvular heart disease.

An enormous amount of material concerning the epidemiology of streptococcal infections has been accumulated and the various ways of spread are described in this monograph.

Of the greatest interest are the epidemics caused by sulphonamide-resistant strains which were found in most of the major outbreaks during 1944-1945. Although this could not be definitely proven, these strains seemed to originate in the civilian population and were apparently brought into the camps by newly inducted recruits or ratings returning from leave. Chemoprophylaxis, although effective as long as sensitive strains only were present, failed completely, as did apparently other attempts to prevent or restrict streptococcal epidemics.

The book ends with a summary of the problems which should be examined before suppression of epidemics can be undertaken with success.

[1] "Microbiology and Man", by Jorgen Birkeland, Ph.D.; Second Edition; 1949. Baltimore: The Williams and Wilkins Company. Sydney: Angus and Robertson, Limited. 9" x 5¾", pp. 544, with 54 illustrations. Price: 37s. 6d.

[2] "The Epidemiology of Hemolytic Streptococcus: During World War II in the United States Navy", by Alvin F. Coburn, M.D., and Donold C. Young, M.D.; 1949. Baltimore: The Williams and Wilkins Company. Sydney: Angus and Robertson. 9" x 5¾", pp. 242. Price: 30s.

Books Received.

[The mention of a book in this column does not imply that no review will appear in a subsequent issue.]

"Modern Discoveries in Medical Psychology", by Clifford Allen, M.D., M.R.C.P., D.P.M.; Second Edition; 1949. London: Macmillan and Company, Limited. 8½" x 5½", pp. 246. Price: 12s. 6d.

Based on six lectures delivered under the auspices of the University of London.

"Tablet Making", by Arthur Little and K. A. Mitchell; 1949. Liverpool: The Northern Publishing Company, Limited. 8½" x 5½", pp. 132, with many illustrations.

Gives a comprehensive description of the processes of tablet making, including mixing, granulating, drying, compressing and coating.

"The Value of Hormones in General Practice", by W. N. Kemp, M.D.; 1949. Burgess Publishing Company. 11" x 8", pp. 115. Price: $3.00.

Designed to help general practitioners in the use of available pharmaceutical hormonal preparations.

"The Design and Equipment of Hospitals", by Ronald Ward, F.R.I.B.A., F.I.Arb., M.R.San.I.; 1949. London: Baillière, Tindall and Cox. 9¾" x 7¾", pp. 378, with 177 illustrations. Price: 42s.

Intended for medical practitioners, administrators, architects and engineers.

"The Retarded Child: A Guide for Parents", by Herta Loewy; 1949. London: Staples Press, Limited. New York: Staples Press Incorporated. 7¾" x 4¾", pp. 52.

An outline of a method for the training of mentally retarded children.

"Electrocardiographic Technique: A Manual for Physicians, Nurses and Technicians", by Kurt Schnitzer, R.T., M.D.; 1949. New York: Grune and Stratton, Incorporated. 6" x 8¾", pp. 100, with 46 illustrations. Price: $3.50.

Intended particularly for technicians not trained in electrocardiography.

"A Synopsis of Medicine", by Sir Henry Letheby Tidy, K.B.E., M.A., M.D., B.Ch. (Oxon.), F.R.C.P. (London); Ninth Edition, revised and enlarged; 1949. Bristol: John Wright and Sons, Limited. London: Simpkin Marshall (1941), Limited. 7" x 5", pp. 1268. Price: 30s.

Aims to provide a synopsis of such principles of medicine as are of importance.

"Aviation Medicine: Its Theory and Application", by Kenneth G. Bergin, M.A., M.D., D.P.H., A.F.R.Ae.S.; 1949. Bristol: John Wright and Sons, Limited. London: Simpkin Marshall (1941), Limited. 8½" x 5½", pp. 468, with 131 illustrations. Price: 35s.

An attempt to present a brief review of the physiological, medical, psychological and epidemiological problems associated with aviation.

"A Psychiatrist Looks at Tuberculosis", by Eric Wittkower, M.D.; with an introduction by John Rickman, M.D.; 1949. London: The National Association for the Prevention of Tuberculosis. 8½" x 5½", pp. 154.

Written chiefly for those in charge of tuberculous patients.

"Industrial Toxicology", by Alice Hamilton, M.D., and Harriet L. Hardy, M.D.; Second Edition; revised and enlarged; 1949. New York: Paul B. Hoeber, Incorporated. 8" x 5¼", pp. 588. Price: $7.50.

Deals with industrial poisons, their action on the body and the most efficient methods of protection.

"Atlas of Roentgenographic Positions", by Vinita Merrill, Volumes I and II; 1949. St. Louis: The C. V. Mosby Company. Melbourne: W. Ramsay (Surgical) Proprietary, Limited. 12" x 8¾"; Volume I, pp. 320, Volume II, pp. 400, with many illustrations, some coloured. Price: £11 5s. for the two volumes.

Intended to provide a practical reference book for X-ray technicians.

"The Surgical Clinics of North America" (issued every two months). Lahey Clinic Number; 1949. Philadelphia and London: W. B. Saunders Company. Melbourne: W. Ramsay (Surgical) Proprietary, Limited. 8" x 5¼", pp. 354, with 170 illustrations. Price: £5 5s. (paper binding) and £6 6s. (cloth binding) per clinic year.

A symposium on surgical technique comprising 31 contributions.

The Medical Journal of Australia

SATURDAY, OCTOBER 15, 1949.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: surname of author, initials of author, year, full title of article, name of journal without abbreviation, volume, number of first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

"DISEASE KNOWS NO HOLIDAY."

THOMAS FIASCHI, a general surgeon who practised in Sydney during the early years of this century and who died in 1927, was devoted to the welfare of his patients in a singular fashion. He insisted that he should always be informed by his house surgeon if something happened to interrupt the recovery of one of his patients in the public wards of Sydney Hospital and he would come to the bedside of the patient at any hour of the day or night. He did not think that his diligence was in any way unusual; when comment was made about it he would remark in his inimitable way that "disease knows no holiday". That was sufficient reason.

With the passage of time the ideas of society generally have altered in regard to hours of work and the need for rest. The two world wars showed, as nothing else probably could have shown, that if man is to give of his best in industry, he must have reasonable time for rest and recreation. And we all know that this is true, not only for the worker with his hands, but also for brain workers and for those in professional spheres of activity. The speed at which man lives today has an effect on the nervous system, and this wear and tear affects the doctor just as much as, possibly more than, it affects other persons. Most people will agree with this. But there is another side to be considered. The face of medical practice has altered to a certain extent during the last decade or two because some disease conditions previously obscure have been clarified, certain effective and specific drugs have been discovered, and the influence of the nervous system in the maintenance of health has been recognized. While it may be argued that the practice of medicine may on this account be placed on a basis that is at least more easily workable, the person who becomes ill is still a human being, he falls ill in sudden and unexplained ways and he needs the comfort, which implies the presence, of his medical attendant. On account of the usual "wear and tear" on the nervous system, already mentioned, the patient of today probably needs the presence of his doctor more than the patient of thirty or forty years ago needed him.

At its meeting of July, 1949, the Federal Council of the British Medical Association in Australia considered positive proposals for a national health service. It should be explained that when the term national health service is used, the reference is not necessarily to a health service elaborated and controlled by the Commonwealth Government. A health service for the nation is a national medical service, and it is this kind of service which the members of the British Medical Association in Australia claim that they are able to give. Among the proposals considered by the Federal Council were those contained in a document from the Queensland Branch. One of the most important had to do with the provision of a twenty-four hour service in private practice. The Federal Council recommended to Branch Councils that all members in private practice should be informed that it was their duty to arrange for the provision of such a service. What the Federal Council intended by this recommendation should have been quite clear. The Federal Council recognized that "disease knows no holiday" and that people may become acutely ill at any hour during the twenty-four on any day of the week. The Council stated in its resolution that a twenty-four hour service could be assured by the cooperation of doctors in a district in several ways—by the employment of assistants, or by the formation of partnerships or group practices, or by the preparation of a roster of practitioners who would be available outside the usual hours of practice, or by the use of a central telephone address from which patients could be referred to a practitioner for emergency services.

It would be difficult to exaggerate the importance of this matter to the practice of medicine at the present time. The Federal Council, members of Branch Councils and everyone connected with medical practice appreciate the fact that the medical practitioner is entitled to relaxation just as much as any other member of the community. It is appreciated, too, that many unnecessary calls are made on a doctor at an hour which most people regard as a time for relaxation. Furthermore, it must be emphasized on the other hand that, no matter how many practitioners may be on duty at a given time, occasions will arise when urgent calls cannot all be attended to without delay. All these facts notwithstanding, the practitioner has an obligation which he cannot escape; it is an obligation he accepted when he chose to follow the exacting and responsible calling of medicine. The medical practitioner insists on, and is entitled to, his freedom—freedom to practise where and in what manner he chooses. But he can never be freed from his essential obligation. Nowadays many practitioners agree among themselves that they shall be off duty at certain times, week-ends and so on. This is satisfactory and proper. The difficulty in many places is that the public cannot always discover who is on duty; at week-ends telephone calls to the consulting rooms or homes of some doctors go unanswered. It is possibly true that the practitioner's wife or the members of his family need to be freed from the care of the telephone. If this is so, some arrangement should be made for urgent messages to be taken and for patients to be directed to the doctor on duty. Nowadays we hear a great deal about "baby-sitters"; why not create a body of "telephone sitters" for the convenience of doctors and the benefit of the public? Local medical associations and

subdivisions of Branches as well as groups of practitioners in towns and suburbs would do well to give this whole matter their earnest and immediate attention. Members of the medical profession wish to resist the threat of nationalization. There is no surer way of encouraging this threat than to behave as though disease takes a holiday when doctors wish to enjoy one.

THE RETIREMENT OF DR. S. W. G. RATCLIFF.

AFTER serving the Royal Alexandra Hospital for Children, Sydney, for many years as chief executive officer, Dr. Sydney William Gardiner Ratcliff is about to retire. His period of service has been marked by such wisdom and efficiency, and the hospital during this period by such growth and increased usefulness to the community, that the occasion cannot be allowed to pass unnoticed. Dr. Ratcliff's appointment as chief executive officer and medical superintendent in 1920 was the first of its kind in New South Wales. Later on other hospitals in New South Wales followed the example of the Royal Alexandra Hospital for Children, and as far as can be gathered without any regrets. The method of control was advocated by Sir Robert Wade in April, 1939, in an editorial in *The Australian and New Zealand Journal of Surgery*; it was also discussed at some length in this journal on November 11, 1939, and June 21, 1941. In appointees it calls for special aptitude and for special training in medical matters on the one hand, and on the other in all the varied aspects of hospital organization and management. In one of our discussions we declared that a hospital today was an enormous business concern. This is a fact and the business has several highly specialized aspects. But the temptation to discuss this type of "one-man" administration must be resisted—we must return to Dr. Ratcliff.

For a year before Dr. Ratcliff became chief executive officer of the Royal Alexandra Hospital for Children he had been chief resident medical officer, and a lay secretary had been in charge of the business administration, building, plant *et cetera*. The by-law under which the appointment is held reads as follows:

> There shall be a Chief Executive Officer and Medical Superintendent who shall have the superintendence and control of the Institution and Grounds, and shall be responsible to the Board and House Committee for the due and efficient performance of their duties by all officers, servants, and employees, and for the discipline of the entire establishment.

When Dr. Ratcliff took over the new office the Secretary was appointed Organizing Secretary and was given an office in the city. From the year 1920 the history of Dr. Ratcliff's administration is the history of the hospital. The creation and development of the institution are to be credited in great measure to the vision, organizing ability and driving power of the late Charles Percy Barlee Clubbe and of Sir Robert Wade—two names which come to mind whenever the Royal Alexandra Hospital for Children is mentioned. But it was Dr. Ratcliff who carried into effect the plans that had been wisely laid. Some of the major developments may be named. In 1921 the Convalescent Home of the hospital was established at Collaroy. A speech therapy department, an almoner department (the first in New South Wales), an orthoptic department and the Nellie May Simmonds Department of Pathology were established. In 1926 the hospital became a clinical school for the teaching of pædiatrics within the University of Sydney. In 1930 the Crippled Children's Activity School was started as a joint activity of the hospital, the Department of Public Instruction and the Society for Crippled Children. In the same year the hospital was gazetted under the *Public Hospitals Act* as an institution for the treatment of private and intermediate patients. A small cottage containing eleven beds was set apart for this purpose, and this eventually developed into the private and intermediate section, containing 70 beds, and was made available to the public and the medical profession in 1939 as Wade House. In 1931 the Charles Clubbe Infectious Diseases Block was opened and an occupational therapy department was started. At present there are 439 beds at the main hospital and 100 at Collaroy.

To state these facts and to describe Dr. Ratcliff's period of office as marked by success is not to do him justice. Efficiency alone, though wholly admirable, is cold and does not arouse the enthusiasm called forth when human understanding goes hand in hand with it. Dr. Ratcliff has been efficient in a first-rate fashion, but he has also gained the confidence and the warm personal regard of the "officers, servants and employees" of the institution. When persons not immediately connected with the hospital have sought him on one pretext or another they have been treated with unfailing courtesy and consideration. Administration and direction which can engender a sense of cooperation are not usual. Dr. Ratcliff retires from his honourable and important position with the appreciation and goodwill of the medical profession in New South Wales and of hospital workers allied with it.

Current Comment.

THE INFLUENCE OF "RUTIN" ON THE EFFECTS OF IRRADIATION.

IT is a strange paradox that the scientific brain of man which contrives a vehicle of destruction devises also some means of relief from its malign effects. Perhaps the writer of *Proverbs* in speaking of the heart of man that "deviseth wicked imaginations" really meant that cold calculating part of his neopallium, and not those softer parts more inclined to goodness and mercy. It is rather chastening to read the first sentence in J. B. Field and P. E. Reckers's article on the effect of flavonoids on Röntgen irradiation disease.[1] In it the authors write: "Prior to the development of the atomic bomb, the effects of intensive ionizing irradiation on mammals were studied only occasionally." This article recounts attempts to reduce the mortality in dogs submitted to irradiation by the administration of the so-called flavonol glucosides, in order to check the hæmorrhagic lesions. The animals in question were carefully controlled with regard to their diet and general health for some time before. After a single dose of total body irradiation full hæmatological examinations were made, including all aspects and behaviour of the formed elements of the blood. The biological response to irradiation was carefully observed; one of the most prominent features was the appearance of hæmorrhagic manifestations. These affected the gingival margins, which showed oozing, the epidermis, on which petechiæ appeared and the mucous surfaces, causing bleeding from the nose, stomach or bowel. Animals which succumbed invariably showed hypoplasia of the bone marrow, the spleen and the lymph nodes, with an associated reduction of the formed elements of the

[1] *The American Journal of the Medical Sciences*, July, 1949.

blood. There was no gross evidence of infection. The effect of an aqueous concentrated extract of lemon peel was then tried. This was given to other dogs for a week before irradiation and for a month afterwards. Blood examination of these and other control animals did not reveal any definite difference between the two groups, but there was no question that the lemon extract was effective in increasing the rate of survival. The survival percentage of treated animals was 60 after a period of three weeks, and in the untreated only 36. The value of such extracts in the treatment of purpura has been attributed to ascorbic acid, but assay of the lemon peel showed that the amount of vitamin *C* present in the concentrate was very small when compared with that already present in the diet. A trial of vitamin *C* before and after irradiation failed to give comparable protection. Therefore the effect of "Rutin" was tried, as certain flavonol glucosides, such as "Rutin", have been found effective in controlling similar hæmorrhagic states. Lemon peel, moreover, is rich in the substance called by Szent-Györgi vitamin *P*. "Rutin" was given orally in capsules both before and after irradiation, and secured results identical with those obtained with the lemon extract. An attempt was made to estimate the hæmorrhagic tendency by the ease or otherwise with which petechiæ could be produced; the tendency was lessened after the giving of "Rutin". No changes were observed in prothrombin or fibrinogen content of the blood, but there was a slight lengthening of the coagulation time. No difference was apparent in the number or type of the blood cells; some change in the numbers of primitive cells was noticed. Other elaborate analyses of the comparative effect of "Rutin" administration were made, including excretion studies; irradiation did not appear to alter the excretion rate. After a full discussion of their findings the authors conclude that the giving of "Rutin" both before and after irradiation undoubtedly lessened the risk of hæmorrhagic lesions; it was very much more effective than the giving of "Rutin" only after the irradiation. Though septicæmia was a common terminal finding, death was due to a tendency to bleed associated with vascular dysfunction as well as thrombocytopenia. The existence of vitamin *P* affecting vascular stability is given substantiation by this report. No clinical application of these findings is suggested by the authors, but there would appear to be possibilities.

TENSILE STRENGTH OF SUTURES.

SOME observations on the tensile strength of sutures, which should be of interest to surgeons, have been made recently by D. M. Douglas, lecturer in experimental surgery in the University of Edinburgh.[1] In the first of two short papers, Douglas describes a piece of apparatus designed to test the effective strength of sutures as used in surgery, in contrast to the method described in the British Pharmaceutical Codex. In this latter method distraction is applied either to the ends of a single strand or to the ends of a strand in which a surgeons' knot has been tied, distraction being continued until the suture breaks; in the first instance the value is termed "straight pull" strength and in the second "knot" strength. Douglas points out that in tissues a suture is never called on to bear the type of strain to which it is submitted in this test. The apparatus which he has devised more nearly imitates the practical conditions, and he has shown from it that with an interrupted suture the effective tensile strength is over twice the British Pharmaceutical Codex "knot" strength and with a continuous suture is up to ten times that strength. This is not a mere technical quibble, for, as Douglas states, there is little doubt that the less foreign material left in a wound, the more readily and soundly will the wound heal. His results would indicate that the British Pharmaceutical Codex methods of estimating tensile strength tend to make surgeons use much too heavy suture material. He makes a simple and practical suggestion how the difficulty may be overcome immediately without modification of existing equipment, namely, that the knotted loop should be used for testing instead of the knotted strand. If this value was clearly printed on the label within the ampoule, the surgeon could tell at a glance the tensile strength of a single interrupted suture of any material and so would have information of immediate practical value.

In a second paper Douglas describes an investigation into the loss of tensile strength occurring when sutures are implanted in living tissues. A series of unabsorbable sutures of the types commonly used in the repair of hernia were implanted in the abdominal wall of rabbits. At monthly intervals they were removed and tested for tensile strength. The results are illuminating. Organic suture materials—silk, cotton and linen—lost tensile strength rapidly after the second month and by the sixth month were either disintegrated or so weak as to have little power of reinforcing a defect; linen lost its tensile strength slightly less rapidly than silk and cotton. In contrast, the synthetic material nylon and the metallic sutures—stainless steel, tantalum and silver—lost little tensile strength, and at the end of six months were on the whole as strong as when inserted. Douglas concludes from these investigations that the organic suture materials cannot contribute strength to a hernial repair for longer than a few months; even a moderately heavy silk suture cannot be relied on to withstand strain after two months, and linen and cotton sutures are little, if any, better. The metallic sutures, on the other hand, can offer a strong and lasting scaffolding upon which the essential repair of fibrous tissue may develop, provided that they do not undergo fracture from work-hardening. Nylon is almost as good, though the tensile strength of an individual sample is difficult to predict; not being subject to work-hardening, it has certain advantages over metallic sutures for hernial repair in such mobile parts of the trunk as the epigastrium.

Douglas also draws attention in this paper to the confusing system of numbering sutures at present in vogue. The metallic sutures are supplied according to the standard wire gauge, and other types of sutures are numbered, but the same number indicates different calibres with different types of suture; for example, number one nylon, silk and catgut have respective diameters of seven, nine and twenty-three thousandths of an inch. The most reasonable way of numbering sutures, it is suggested, would be to quote the diameter in thousandths of an inch, so that, for example, all types of sutures with a calibre of seven-thousandths of an inch would have the number seven, and so on. This sounds rational and simple. However, as a compromise for the benefit of the conservative, Douglas suggests that all suture materials might be labelled according to the British Pharmaceutical Codex specifications for catgut. In this way, as he states, a bewildering situation would be converted into one which, though illogical, would be relatively easy to understand.

[1] *The Lancet*, September 17, 1949.

ACUTE APPENDICITIS AND ACUTE INFECTIOUS DISEASES.

ACUTE APPENDICITIS has managed to remain so elusive in relation to its ætiology that an air of mystery surrounds the subject. In that atmosphere almost legendary ideas have grown up, in the lay mind at least, and many medical practitioners have their own private theories which they would probably hesitate to put at the mercy of their colleagues' criticism. Various impressions, based on limited observation, have been formed of the relationship of acute appendicitis to acute infectious diseases. Practical light on this question has been thrown by Knowles B. Lawrence and George W. Waring, junior,[1] as a result of a study of cases of acute appendicitis occurring in children under the age of twelve years treated during a period of twenty-one years at the Haynes Memorial, the infectious disease unit of the Massachusetts Memorial Hospital in Boston. There are considerable difficulties in drawing

[1] *The New England Journal of Medicine*, July 7, 1949.

conclusions from some of the figures presented. Local public health policy has encouraged admission to hospital of all patients with scarlet fever whenever possible, whereas admissions for measles, pertussis, chicken-pox, mumps and rubella have been chiefly because of complications. However, the incidence amongst patients with scarlet fever appears to be approximately the same as that calculated for all children under the age of ten years in Massachusetts, and it seems that the incidence amongst children with other infectious disease would be no greater than that amongst those with scarlet fever. There is certainly no support for a commonly held view that children with scarlet fever and other common contagious diseases have a greater tendency than normal children to the development of acute appendicitis.

Another point of practical interest is the support given to the general experience that the diagnosis of acute appendicitis is made more difficult in a child already ill with an infectious disease. A much higher incidence of rupture of the appendix with peritonitis was found in this series than in a group from a large children's clinic admitting very few patients with infectious disease. It seemed likely that this difference was due to greater difficulties in diagnosis during the period before the patient's admission to hospital. The mortality rate in a series of 100 cases in which the appendix was examined was 8%. The highness of this rate is considered by Lawrence and Waring to be attributable only in small part to diagnostic difficulties and the complications imposed by the coexistence of the infectious diseases, but it is probably significant that seven of the eight deaths occurred before the introduction of such modern treatment as chemotherapy, parenteral administration of fluids, intubation and transfusion; these deaths were due to sepsis and might have been prevented had such therapy been available. Lawrence and Waring's data and conclusions are an interesting contribution to the understanding of a relatively commonplace but important subject. It would be useful to have some corresponding Australian figures for comparison.

THE TREATMENT OF GONOCOCCAL ARTHRITIS.

It is perhaps surprising to see a review of over 200 patients suffering from gonococcal arthritis, since such striking therapeutic advances have been made in gonococcal infections in general. Such a review has been recently published, in which J. A. Robinson, H. L. Hirsh, W. W. Zeller and H. F. Dowling have compared the results obtained with penicillin, sulphonamides and artificial fever.[1] When fever treatment was introduced for syphilis some years before the war, it was noticed that patients who also had arthritic complications or sequels of gonorrhœa showed noticeable improvement in the condition of the joints. Shortly afterwards the sulphonamides took the field, and later still, penicillin, and there does not seem to have been any agreement as to the exact value of the newer forms of treatment in resolving the often serious joint changes.

The authors have analysed the case records of one hospital from 1936 to 1947, adopting as diagnostic criteria the presence of gonococci in smears or cultures of the joint fluid, or in the genito-urinary tract, with, of course, in addition the presence of inflammatory rheumatic signs. Care was taken not to make the diagnosis from bacteriological evidence derived from the genito-urinary tract alone, unless other possible causes for the joint trouble could be excluded. The complement-fixation test was found to be most reliable in diagnosis also, and reactions were demonstrated in 80% of patients with proven gonococcal arthritis. Some figures are also quoted concerning the general value of this test, but it may be remarked that reliance on it depends a good deal on the accuracy and sensitivity of the technique used. In this series the numbers of males and females were nearly equal. The disease was confined to one joint in only 39 of 202 patients, and in the remainder affected many joints. It was noted that a wandering infection would sometimes become fixed in one joint to the exclusion of others. The knee was by far the most commonly affected joint. In assessing the value of treatment the authors divided the patients into an "acute" and a "chronic" group, the boundary between these being taken as a duration of the condition for thirty days. Fever therapy was given to 55 patients; two types were used, the induction of pyrexia by the use of the hypertherm, and the intravenous administration of typhoid vaccine. In both these groups the response was much better in the acute cases, as one might expect. The technique used with typhoid vaccine was not adequate in a number of cases, as a sufficient degree of fever was not produced. One hundred and forty patients were treated with sulphonamides; the successes in this group were not equal in number to those in the acute group treated with the hypertherm, but nevertheless reached nearly 70%, the latter giving 77%. Again, early treatment was an important factor. The authors point out that it is hard to compare the sulphonamide series with others, or even the more recently treated with those seen at an earlier period, because of the appearance of more resistant strains of the gonococcus. Thirty-two patients were treated with penicillin, but here, too, the results are not all comparable, since the dosage has varied considerably. It is in fact very difficult to submit such a series as this to figures, as only strictly comparable forms of the disease treated in a standard way can really be placed side by side.

The authors in their discussion state their belief that a fairly extensive trial has been made of the three methods, and their opinion is that the introduction of these methods has improved the degree and speed of recovery of patients with this rather disheartening malady. Most reports state that an average of 75% of patients recover with the use of artificial fever, but the authors think that the risks are not negligible and prefer other measures. They finally conclude that penicillin therapy is the method of choice, a dosage of two to five million units being administered over a period of five to ten days. Sulphonamides may be tried instead, if desired, as the administration is so simple, and should also be given if a good response is not obtained from penicillin. Fever may thus be reserved for relapsing or resistant forms. No mention is made of antiserum, which seems to have faded out with the arrival of more effective measures, and by reason of its not negligible discomforts, and certain degree of risk. The moral seems to be to use really effective dosage of the modern powerful remedies as early as possible in all gonococcal infections.

[1] *Annals of Internal Medicine*, June, 1949.

THE DEVELOPMENT AMONG BACTERIA OF RESISTANT STRAINS TO ANTIBIOTICS.

Speaking in a discussion which followed the reading of two papers on otogenic brain abscess at a meeting of the New South Wales Branch of the British Medical Association on April 28, 1949 (see The Medical Journal of Australia, September 17, 1949, page 440), Edgar Thomson referred to the increasing incidence of strains of Gram-positive organisms, especially staphylococci, which were resistant to penicillin. This he attributed to the widespread and unnecessary use of penicillin, and he pointed out that it was not of much help to expect to fall back on streptomycin, as streptomycin resistance could be produced in less time than penicillin resistance. Thomson, with Phyllis M. Rountree, has now published a report[1] on their investigations into the incidence of penicillin-resistant and streptomycin-resistant staphylococci in the Royal Prince Alfred Hospital, Sydney, during the period from October, 1948, to March 31, 1949, together with observations on the nasal carrier rate of *Staphylococcus pyogenes* in the hospital staff and in an unselected group of the general population. It was found that of 228 strains of *Staphylococcus pyogenes* isolated from 196 patients in the hospital, 107 (47%) isolated from 104

[1] *The Lancet*, September 17, 1949.

patients were penicillin sensitive and 121 (53%) from 92 patients were penicillin resistant; 216 strains (84·5%) were streptomycin sensitive and 12 (5·5%) were streptomycin resistant. Phage typing of the strains showed that no predominant phage types occurred among the penicillin-sensitive strains, but among the penicillin-resistant strains 75% belonged to five phage types, with two types predominating. Analysis of the case records of patients yielding penicillin-resistant staphylococci revealed only eight cases of clinical staphylococcal infection in which infection occurred with certainty outside the hospital community. In 54 cases it was considered that cross-infection had occurred while the patients were in hospital. In four cases conversion to penicillin-resistance occurred while the patients were in hospital. Most of the cases of cross-infection were those of clean surgical wounds, and the evidence indicates that the wounds were infected with strains already penicillin resistant at the time of entry into the wound. Surveys of the nasal carrier rate of penicillin-resistant *Staphylococcus pyogenes* among 200 members of the hospital staff and among members of an unselected group of 200 blood donors revealed a carrier rate of 32% among members of the hospital staff compared with 4% among the blood donors. A close correspondence was found between the distribution of phage types present in the noses of the staff and that in the lesions of patients cross-infected in hospital. This finding, Thomson and Rountree point out, lends further support to the theory that the nasal mucosa of members of a hospital community acts as a reservoir from which staphylococci are distributed, directly or indirectly, to new entrants into the community, whether patients or staff. A large number of carriers among the hospital staff had one particular phage type of staphylococcus (31*b*), a finding in contrast with that for the general community and therefore for nurses entering hospital for the first time; it appears that this particular strain can take the place of other staphylococci in the nasal mucosa, though the reason for this is not yet known. No streptomycin-resistant strains were isolated from nasal carriers; of the twelve such strains isolated from patients, eleven came from lesions which had been treated with streptomycin and in which the strains had previously been sensitive. The twelfth strain appeared towards the end of the survey as a cross-infecting organism in a clean surgical wound in a patient who had received no streptomycin; it belonged to phage type 31*b* and was also penicillin-resistant. Rountree and Thomson, with justification, regard its appearance in the hospital as disquieting. Their broad conclusion from the survey is that there is not at present a high proportion of penicillin-resistant staphylococci in the general population of Sydney, but in a hospital community where there has been opportunity for the selection and dissemination of resistant strains, a reservoir of such strains exists among staff and patients, and constitutes the source of infection of new entrants into the community. On the broader issue of the development of resistant strains, as it affects the profession in general, it might reasonably be remarked that the indiscriminate and unnecessary use of antibiotics is dangerously reminiscent of the behaviour of the silly little boy who cried wolf.

KÜNTSCHER'S MEDULLARY NAIL.

LAST year we reviewed Lorenz Böhler's book "Medullary Nailing of Küntscher" (see THE MEDICAL JOURNAL OF AUSTRALIA, December 18, 1948, page 719), in which he described his experience with Küntscher's nail, including 600 case histories in the book. Böhler's frank account of the bad as well as the good results from the use of this method of internal fixation was, to say the least, striking, and in the review the advice was given that all should read and study the book before considering using the method, which they might decline to adopt after reading the book. The opinion was also expressed that the method should be confined to the middle third of the femur in special cases, for example, in alcoholic dementia or for elderly patients for whom prolonged splinting has disadvantages, and should be used only if adequate apparatus exists. In his latest communication on the subject,[1] Böhler, who writes in conjunction with Jörg Böhler, brings the number of cases in which the method has been used up to about 700. It is explained in the paper that some time ago, feeling that their results were unsatisfactory for fractures other than those of the femur, the Böhlers reviewed all their cases, and the review indicated that, for bones other than the femur, the results obtained with conservative methods were better than those obtained with medullary nailing by the method of Küntscher. They consider that medullary nailing is the best treatment for transverse closed fractures, for open fractures, after most osteotomies, and for non-union of the shaft of the femur, if suitable equipment is available. The union of the fragments is so firm that the patient can walk without additional fixation after the wound has healed, that is, in two or three weeks. Thus muscle atrophy and stiffness can be almost entirely prevented. With closed medullary nailing, the danger of infection is slight, because only a small incision is made apart from the fracture site. With open medullary nailing, the danger of infection is reduced by exact immobilization. The Böhlers also use medullary nailing for closed transverse fractures in the middle third of the shaft of the humerus. This method is no longer employed for fractures of the tibia or of the forearm, as conservative methods have proved to be better. Unless much shock is present the closed fractures are nailed within the first few hours after injury. After the width and length of the bone have been determined by means of good radiograms, and after proper medullary nails have been selected, spinal anæsthesia is induced. The patient is placed on a reduction apparatus. With fractures of the lower third of the femur the knee should be not extended, but semiflexed. One X-ray machine is placed at the ventral aspect and a second one at the medial side of the thigh. By means of longitudinal traction, the shortening is overcome, and by means of canvas slings or wooden rings, attached to rotating bars, the lateral displacement is corrected. If fluoroscopic control shows good reduction from each side, radiograms are taken. If they show good alignment of the fragments, the skin of the hip is prepared for surgical operation. An incision of about two to three centimetres in length is made, five centimetres above the tip of the trochanter. An awl is inserted, to the medial side of the greater trochanter, into the marrow cavity. The nail guide is then inserted, by means of a handle, through this hole, its course being checked by fluoroscopy. As the guide advances toward the knee joint, additional radiograms are taken. When they reveal a satisfactory position, the medullary nail is driven over the nail guide with a hammer, again under fluoroscopic control. As the medullary nail approaches the skin, the nail guide is withdrawn and the nail is hammered farther in with a nail-driver, until one end is only two centimetres from the tip of the trochanter and the other one centimetre from the knee joint. The wound is then closed, and again radiograms are taken. Should diastasis exist at the fracture site, it is overcome by a strong thrust with the flat of the hand against the knee joint. Reduction may be very difficult and should never be attempted without a reduction apparatus. The insertion of the nail guide may also be troublesome, but usually no difficulties arise in driving in a nail of the proper width. The Böhlers have used closed medullary nailing in three cases of solitary bone cyst of the upper third of the femur with good results, and they state that it can also be used for spontaneous fractures occurring at the site of metastases of malignant tumours, which are found mostly in the upper third of the femur. The patients can walk on the limb with the nail in position, although the fracture fragments will not reunite. The Böhlers point out that medullary nailing is a technically difficult procedure and should, therefore, be carried out only in specially equipped hospitals. However, with the development of technique and understanding of the indications for its use, which comes only with experience, the method seems to be finding an accepted place amongst orthopædic procedures.

[1] *The Journal of Bone and Joint Surgery*, April, 1949.

Abstracts from Medical Literature.

OBSTETRICS AND GYNÆCOLOGY.

Pellet Implantation with α Œstradiol for the Relief of the Menopausal Syndrome.

Harold M. Imerman (*The Western Journal of Surgery, Obstetrics and Gynecology*, January, 1949) discusses œstrogen therapy for the relief of menopausal symptoms and records the results of pellet implantation with α œstradiol in 22 cases. He states that this method of œstrogen therapy has been used since 1937 with good results. One application gives prolonged relief; there are no untoward gastro-intestinal symptoms and there is no evidence that it causes uterine bleeding as sometimes is found with stilbœstrol treatment. The author has used an œstrogenic pellet containing 25 milligrammes of α œstradiol (Schering), which he considers the most potent and effective of the œstrogenic hormones. Laboratory tests have shown its ability to increase the urinary œstrogen level for ten to sixteen weeks. Clinically it has been found that menopausal symptoms are relieved for fourteen weeks after a single treatment, and return of symptoms has been gradual and can be controlled by a second implantation. The technique is simple and can be performed in the consulting room. A small quadrant of skin on the lower part of the abdomen is prepared and the site of implantation is infiltrated with "Novocain". A transverse incision one-quarter of an inch in length is made through a skin crease and a pellet injector is inserted through the fat to the level of the fascia. The pellet is injected and the small wound is covered with a "Band-Aid". Œstrogenic effects are noticed within a period of four to seven days. This method is not meant to supplant oral or parenteral treatment, but is rather for stubborn cases in which the patient has not responded to the usual treatment; it is of special benefit to patients with symptoms following surgical treatment.

Urethral Diverticulum in the Female.

V. S. Counsellor (*American Journal of Obstetrics and Gynecology*, February, 1949) presents a study of 71 cases of diverticulum of the female urethra treated surgically at the Mayo Clinic. He is of the opinion that the lesions are congenital in origin and are subsequently influenced by trauma and non-specific infections. Any diverticulum that cannot empty itself will become infected with the production of an abscess. Some diverticula are of large size, perhaps as long as the urethra and one centimetre in diameter; urine having an ammoniacal odour can be freely expressed from many of these. Symptoms may exist for a few weeks, or may last for thirty-three years or more as in one case. Pain, frequency of micturition, leakage of urine, dyspareunia and finally the presence of a vaginal mass are the cardinal points in diagnosis. Urine passed often contains large quantities of pus, and urine obtained by catheterization may be normal. The pain is of four types—low abdominal or suprapubic, perineal, vaginal or urethral. Leakage of urine or a discharge from the urethra was noted in 40% of cases. Characteristic leakage is that which immediately follows urination, when there is a small involuntary discharge of urine. Dyspareunia was present in 10% of cases and was a complaint of patients who had rather acute inflammatory reactions in the anterior vaginal wall. Masses were noted in the anterior vaginal wall in 40% of cases; such masses may consist of urine, pus or multiple calculi. The severity of the complaint is out of all proportion to that which the physical findings concerning the urethra indicate should actually be produced. The diagnosis may be made by vaginal examination and by the expression of pure pus from the urethra by pressure on the mass. Cystoscopic examination is not always successful in identifying the diverticulum; there may be more than one opening, which is usually in the middle third of the urethra in the mid-line. The best treatment is complete surgical excision of the diverticulum and repair of the urethra. When the inner wall of the diverticulum extends along the posterior urethral wall, no attempt should be made to separate the two, as multiple fistulæ may result. The author suspects that urethro-vaginal fistulæ occurring subsequently to repair of cystocele or urethrocele or vaginal hysterectomy could easily be due to a urethral diverticulum which was overlooked.

Management of Potential Obstetric Infection.

C. G. Waters (*The New England Journal of Medicine*, March 10, 1949) points out that the more modern chemotherapeutic agents now available are not sufficient for many of the obstetric infections encountered. Survival is dependent on factors present before the onset of the disease—anoxæmia, blood loss, lowered protein intake and hypotension must be avoided to maintain the integrity of liver function. During pregnancy the patient's general nutrition, especially vitamin and protein balance, must be maintained; any anæmia must be corrected, and sources of infection such as cervicitis, pyelocystitis and vaginal infection must be treated. Diabetes, early toxæmia and systemic disease must be carefully sought. In the last six weeks douching, tub baths and intercourse are prohibited, and the pelvic measurements are determined, in the cases of all *primiparæ* with unengaged heads and *multiparæ* with a history of previous difficult confinements. In labour the danger of repeated vaginal or rectal examinations in increasing morbidity is stressed, although the author points out the value of a complete vaginal examination under aseptic conditions in helping the operator make a decision. When the patient has been in labour more than twelve hours, or when the membranes have been ruptured for more than eighteen hours without the onset of labour, chemotherapy and antibiotic therapy are commenced. A strict watch is kept for the occurrence of anæmia, fluid balance is maintained, and all standard obstetric principles are observed, particularly in regard to contamination of the patient by the staff. In parturition there is little doubt that normal vaginal delivery is safest for both potentially and actually infected patients, and as cultures from the cervix of infected and normal patients do not materially differ, the acquisition of virulence depends on the degree of trauma. Difficult forceps deliveries are probably the greatest contributors to maternal deaths from sepsis; these are often due to poor obstetric judgement and experience. If abdominal delivery is indicated, as often it must be by the very nature of the circumstances resulting in infection in labour, two courses are open—Cæsarean section of one of the several types and Cæsarean hysterectomy. The author considers the latter operation a traumatic one, and as it is transperitoneal the risk of peritonitis is great. The transperitoneal operation for Cæsarean section cannot possibly be as safe as the extra-peritoneal operation, as patients are still dying from peritonitis in spite of the specific drugs available. The author uses low spinal anæsthesia for 10% of his deliveries with forced oxygen administration during and subsequent to the operation. The uterus must never be packed after the operation. In his clinic there has been no death from hæmorrhage, and no uterus has been packed, in the last 25,000 deliveries.

Primary Carcinoma of the Vagina.

S. Way (*The Journal of Obstetrics and Gynæcology of the British Empire*, December, 1948) reports a study of primary cancer of the vagina in 44 patients treated during the last sixteen years at Newcastle. Results of treatment are analysed in order to get a wider knowledge of the disease, and a basis of future treatment is suggested. The incidence of this disease is about 2·2% of the incidence of carcinoma of the cervix, and the average age of patients in the series was fifty-four years. The author states that there is no justification for the attitude that the expectation of life is so short that time spent on attempted cure is not warranted. The thinness of the vaginal wall might be expected to favour the early development of symptoms, but it also permits an early spread to neighbouring organs. The outstanding symptom is vaginal bleeding. Most tumours are squamous-celled carcinomata. There would appear to be an increased incidence of carcinoma of the vagina in women with prolapse who have worn pessaries. There is a free anastomosis between the lymphatics of the upper and lower halves of the vagina and also between those of the right and left sides. Tumours of the upper third of the vagina usually spread in the same direction as cervical carcinoma, those in the lower third of the vagina follow the spread of carcinoma of the vulva, and those occupying the middle third spread by both routes. The survival time after the development of fistula is twice as long as that after fistula complicating carcinoma of the cervix. Eleven of the 44 patients were considered to have too advanced a condition for treatment, six were treated surgically and 27 were treated by irradiation. Tumours situated in the middle and lower thirds of the vagina do not receive effective irradiation from the radium technique employed for carcinoma of the cervix. The author has designed and describes a technique of radium treatment for carcinoma of the vagina which permits the planned application of screened doses of radium at appropriate sites. The applicator is made of transparent acrylic resin, and radium is inserted in two ovoids at the upper end and in

a metal stem which is passed inside the applicator. Accurate apposition of the radium during the time of treatment is maintained by a harness which fixes the lower end of the apparatus to a belt around the patient's waist. The author considers that radium treatment is the method of choice for those cases of vaginal carcinoma which respond to irradiation as assessed by clinical and cytological investigation during treatment. Surgery in the form of block dissection of groin glands and iliac adenectomy is a valuable addition to radium treatment.

Genital Prolapse.

K. PACEY (*The Journal of Obstetrics and Gynæcology of the British Empire*, February, 1949) considers that the primary supports of the uterus and bladder are the *levatores ani* muscles. The role of the pelvic fascia with its special ligaments—pubo-cervical, cardinal and utero-sacral—has been over-emphasized as the chief supporting mechanism of the uterus and bladder. In no other part of the body is such a major activity assigned to fibrous tissue alone. A detailed description of the *levatores ani* muscles is given, and special reference is made to the pubo-coccygeus muscle as a vaginal support. The combined pubo-coccygeus muscles form what the author describes as "the three pelvic slings". The anterior sling surrounds the upper part of the urethra and supports the urethra and base of the bladder, the middle sling surrounds the vagina in the region of its middle strait, and the posterior sling surrounds the rectum in the region of the ano-rectal junction. All forms of genital prolapse result from rupture of one or both of the anterior and middle raphes with consequent loss of sling action. Rupture of the anterior raphe results in cystocele and dislocation of the urethra with associated stress incontinence. Rupture of the middle raphe results in descent of the uterus and vault prolapse. Middle sling destruction can follow slow and careful delivery without external evidence of rupture. The operative repair of prolapse entails advancement of the cardinal ligaments, repair of the pubo-cervical fascia, suture of the anterior raphe, suture of the middle raphe, dislocation of the bladder and amputation of the cervix. The technique of operation is described and illustrated. Before the suture nearest the urethral meatus is tied a fine rubber dam drain is placed beneath the bladder and removed forty-eight hours after operation. An indwelling catheter is left in the bladder for five days, and the bowels are opened on the fifth day with an enema. The author considers that this operation provides a certain cure for stress incontinence of urine and that use of fascial slings and similar procedures are unnecessary.

Vesico-Vaginal Fistulæ.

R. G. KRISHNAN (*The Journal of Obstetrics and Gynæcology of the British Empire*, February, 1949) reviews 100 patients with vesico-vaginal fistula treated surgically during the period January, 1945, to April, 1948. One fistula was a result of *lymphogranuloma inguinale*, one was due to trauma caused in attempted abortion, and the remainder were the results of difficult and mismanaged childbirth in rural parts of India. There were 31 large fistulæ which admitted more than one finger, 61 small fistulæ which admitted one finger or less, and eight pin-hole fistulæ. Classified according to the position of the fistulæ, there were 45 juxtaurethral fistulæ, 21 mid-vaginal fistulæ, 21 juxtacervical fistulæ, and 13 combined fistulæ. Associated pathological conditions and complications found with the fistulæ included destruction of the urethra, severance of the urethra from the bladder neck, destruction of the vaginal portion of the cervix and adhesions of the fistula to the cervix and pubic arch. Treatment was by the flap-splitting method in all cases except four in which new urethræ were formed. Twenty out of 21 mid-vaginal, 17 out of 21 juxtacervical, 29 out of 45 juxtaurethral and 7 out of 13 combined fistulæ were cured at the first attempt. The author states that the juxta-urethral and combined fistulæ are the most difficult and tedious to cure, but even in these cases transplantation of the ureters into the bowel should not be contemplated before at least one attempt is made to close the fistula. The author considers that operation by the abdominal route is not necessary in any type of obstetrical vesico-vaginal fistula. The preliminary treatment of anæmia, local infection and urinary infection is emphasized. The time of election for operation is three months after confinement. The author prefers spinal anæsthesia, and the operation is performed with the patient in the lithotomy position with the buttocks raised. Free mobilization of the bladder is the most important principle of the operation. The suture material used was fine chromicized catgut, silkworm gut and nylon sutures. After operation the patients are nursed in the dorsal recumbent position, and catheter drainage of the bladder is carried out for ten to twelve days. When pregnancy follows a successful repair of vesico-vaginal fistula Cæsarean section at term is indicated.

Endometriosis: Its Surgical Significance.

F. J. KELLY AND K. R. SCHLADEMAN (*Surgery, Gynecology and Obstetrics*, February, 1949) have carried out a critical analysis of 179 patients submitted to surgery for endometriosis. Special reference is made to the importance of progressive dysmenorrhœa as a symptom and to the incidence of fertility following conservative surgical treatment. Various theories concerning the ætiology of the disease are briefly summarized, and the authors conclude that no one theory adequately explains the varied manifestations of endometriosis. Endometriosis was present in 8·9% of 1991 consecutive gynæcological laparotomies, and the average age of patients with endometriosis was thirty-eight years. The characteristic "blueberry spot" appearance is found early in the disease. Later developments are "puckered" areas, numerous strand adhesions and "chocolate" cysts of the ovaries. One out of every three patients in the series complained of increasing or progressive dysmenorrhœa; this symptom, the authors state, is pathognomonic of endometriosis. The dysmenorrhœa is acquired, it tends to increase in severity, and the duration of pain with the menstrual periods indicates the degree of advancement of the disease. Dyspareunia was a symptom in only fifteen cases in the series studied. Pre-operative diagnosis was correct in only 14·5% of cases. Uterine displacement, especially a fixed retroversion, is commonly associated with endometriosis. The peritoneal surface of the uterus, the wall of the uterus and the pouch of Douglas were the most common sites of endometriosis. A lesion was found in an old laparotomy wound of one patient; the authors consider this to have been due to surgical implants at the time of operation. The extent and location of endometriosis and the age of the patient are to be considered in deciding on the extent of surgical treatment. Conservatism, when possible, is a generally accepted surgical principle. Hysterectomy was necessary in 72·6% of cases in the series. Suspension of the uterus is usually necessary when hysterectomy is not performed. After treatment there were 38 patients who could be considered relatively fertile. A follow-up of these 38 patients for two to six years shows that pregnancy has occurred in 23·7% within four years of operation.

Vaginal and Ovarian Metastases from Hypernephroma.

K. H. MARTZLOFF AND C. H. MANLOVE (*Surgery, Gynecology and Obstetrics*, February, 1949) report a case in which bleeding from vaginal metastases was the first symptom of an unsuspected hypernephroma of the left kidney. This is the twenty-third reported case of vaginal metastases complicating hypernephroma. The patient was fifty-seven years of age with a history of vaginal bleeding of five months' duration occurring seven years after the menopause. Diagnostic curettage and total hysterectomy had been performed at another hospital four months previously. When first examined by the authors the patient had persistent vaginal bleeding, and four small discrete nodules were found in the vaginal wall. Excretion pyelography indicated a left renal tumour, and biopsy of the excised vaginal nodules showed typical hypernephromatous tissue. No other metastases were found on investigation, and left nephrectomy was performed two months later when a hypernephroma was removed. Subsequently more vaginal metastases developed and were excised, and eight months after nephrectomy a left-sided retroperitoneal ovarian tumour was removed, which was histologically similar to the hypernephroma. The patient died fourteen months after this operation with a recurrent left renal tumour and metastases in the right kidney, spleen, lungs, brain and myocardium. The vaginal metastases conformed to hypernephroma pattern, and tumour emboli in veins could be demonstrated. The authors state that vaginal metastases from hypernephroma are rare and in the majority of cases have occurred with tumours of the left kidney. The left ovarian vein is considered the avenue of involvement of the left ovary, and the free anastomosis between the left ovarian vein, pampiniform plexus and utero-vaginal venous plexus explains the vaginal metastases. Tumours which metastasize in the vagina, presumably by the blood-stream, are commonly situated in the anterior aspect of the distal end of the vagina. The expectation of life of patients with vaginal metastases from hypernephroma is not beyond two years from recognition of the vaginal lesion. If vaginal metastases of hypernephroma are diagnosed in a patient who has no other demonstrable evidence of renal tumour and no metastases elsewhere, exploration of the left kidney is justified.

British Medical Association News.

SCIENTIFIC.

A MEETING of the New South Wales Branch of the British Medical Association was held at the Women's Hospital, Crown Street, Sydney, on July 21, 1949. The meeting took the form of a series of short papers and clinical demonstrations by members of the honorary medical staff of the hospital. Part of this report appeared in the issue of October 8, 1949.

Chronic Pelvic Sepsis.

DR. MALCOLM DRUMMOND discussed the treatment of an early stage of chronic pelvic sepsis. He said that cervicitis with low-grade pelvic inflammation was the most commonly seen condition in the gynæcological out-patient department. In the group to be discussed the patients suffered from the triad of lower abdominal pain, free vaginal discharge and an erosion of the cervix. The problem for the patient was how to be cured without admission to a hospital bed and by treatment that she could easily carry out.

Dr. Drummond said that the pain was of a continuous aching type; it was felt above the right or left inguinal ligament, or it might extend across the lower part of the abdomen. At times it might be sharp and stabbing or have a bearing-down character. The vaginal discharge was yellow and fluid, being composed of serum, mucus and leucocytes mixed with the cells desquamated from the vaginal wall. The discharge arose from the erosion on the cervix. (The character of the discharge was shown by a slide prepared with material from the cervix stained by the Papanicolaou method.) The cervical erosion was of the superficial type. On vaginal examination the patients were found to have a uterus normal in size and position. No enlargement of the adnexæ could be felt. There might be tenderness of one or all of the pelvic viscera. Other less constant associated symptoms were sacral backache, dyspareunia and menorrhagia.

Dr. Drummond said that the methods of treatment recommended in the literature were very numerous and results were often claimed which were more than optimistic. The following, in summary, were the agents recommended: cauterization by means of Paquelin's cautery, an electric hot wire or diathermy; cauterization with caustics, such as silver nitrate, copper sulphate, iodized phenol or zinc chloride on an applicator; ionization with galvanic current, zinc or copper ions being used; cervical application of sulphonamides or penicillin, and tamponage; the administration of sulphonamides by mouth, of penicillin by the parenteral route, or of œstrogens. After trial of several of the agents enumerated, it was decided in the series under consideration to give a course of sulphamerazine, one gramme three times a day for ten days, and at the same time to commence superficial cauterization of the cervical erosion and endocervical canal with a hot-wire cautery, repeated at three-weekly intervals until the erosion was healed. If no improvement occurred a course of penicillin was instituted, 1,000,000 units being given over four days, at the rate of 30,000 units three-hourly. That required admission to hospital. The following results had been obtained so far: cervical erosion: healed 76%, treatment incomplete 24%; abdominal pain: cured 33%, relieved 42%, unchanged 25%. Courses of penicillin were given in the 25% of cases in which abdominal pain was unchanged, with the following result: cured 10%, relieved 30%, unchanged 60%. Dr. Drummond commented that the result from the penicillin was not encouraging. The 42% of patients whose abdominal pain was relieved could carry on their work effectively, but were conscious of some discomfort. For the patients who were not cured the course of treatment described was helpful in determining the severity of their condition, giving a lead to the future treatment, which might involve persisting with the same treatment, short-wave therapy or, in a very few cases, laparotomy.

Ante-Partum and Post-Partum Intravascular Thrombosis.

DR. K. A. MCGARRITY discussed intravascular thrombosis, its incidence, prophylaxis and treatment, which, he pointed out, had been very prominently in the spotlight of medical interest in the last few years. Anticoagulants and ligation had been introduced as methods of effective treatment. The work of Berquist and Jorpes and others overseas and then recently of Cummine and Lyons in Sydney had turned attention to the possibility of early recognition of the pre-thrombotic state. The use of anticoagulants in obstetrics had been regarded with trepidation in some circles owing to the possibility of initiating bleeding from the placental site. The controlled use of heparin and dicoumarol had removed that risk in the series of cases treated at the Women's Hospital; on no occasion were there any complicating results of anticoagulant therapy and venous ligation was never performed.

Dr. McGarritty went on to say that various causes for the apparently greater incidence of venous thrombosis in obstetrics had been suggested by various writers: the pressure of the expanding uterus against the pelvic vessel, venous stasis, infection of the placental site, the production of thromboplastin from the placenta *et cetera*. He pointed out that venous thrombosis at the Women's Hospital over the last eight years had followed two main types, superficial and deep. The former commenced as thrombophlebitis, usually in superficial veins of the lower extremities, especially if previously affected by varicosities; it was always localized, caused no constitutional symptoms and did not affect coagulation time, and the patients were usually discharged from hospital at about the usual time. The latter commenced as phlebothrombosis, usually in the deep veins of the lower extremities, and often went on to thrombophlebitis; it was associated with constitutional signs and symptoms. There was usually a warning pre-thrombotic state with raised temperature and pulse rate and a lowered coagulation time. The condition might be associated with pulmonary thrombo-embolic lesions, and the patients' stay in hospital was considerably lengthened. Before the introduction of anticoagulants such conditions might keep the patients concerned in hospital for approximately six months. A great number of those patients (approximately 50%) exhibited evidence of toxæmia of pregnancy at some stage of their pregnancy. Manipulative interference or some form of operative obstetrics at the time of delivery, especially if accompanied by infection, was also frequently a precursor of deep thrombosis.

Dr. McGarritty then reviewed the cases of thrombosis occurring at the Women's Hospital over the period of eight years from 1941 to 1948 inclusive; they were divided according to three periods associated with the introduction of additional anti-thrombotic measures.

In the first group (1941 to 1944) medical gymnastics and early ambulation were in force and had remained constant anti-thrombotic measures throughout. Later, in 1945, penicillin was first given to combat the presence of sepsis; that immediately had an effect in diminishing the period spent in hospital from fifty-five days to forty-two days and in reducing the mortality from 16% to 4%. Anticoagulants were introduced in 1947, and the main object of the survey was to show how those measures had reduced the period spent in hospital to nineteen days and the mortality to nil. Dr. McGarrity then pointed out that the figures showed that the incidence of thrombosis had not yet been appreciably reduced, but they also showed how greatly first penicillin and later anticoagulant therapy had reduced the length of stay in hospital and later the mortality from intravascular thrombosis. The 10,000 cases occurring in 1947-1948 would have produced five deaths on the 1941-1944 figures, and that improvement must be attributed to the combined use of penicillin and anticoagulants. It was interesting to compare the figures with overseas results from the Mariestad Hospital before and after anticoagulant therapy; there was a close similarity between the two sets of figures in relation to the reduction in mortality and the period spent in hospital.

Dr. McGarrity then discussed the different types of thrombosis. He said that the superficial lesions, twenty in number in the series, usually occurred in varicose superficial veins of the lower extremity; they occurred within three days of the confinement, and had usually disappeared from the point of view of symptoms and disability within eight days. There were no accompanying pulmonary conditions. The deep lesions occurred in the deep veins of the lower extremity or the pelvis, and also as thrombo-embolic conditions of the pulmonary vessels. There were 66 such deep thromboses, and on fifteen occasions pulmonary complications occurred as isolated or associated conditions.

In contradistinction to the superficial thrombus, the deep lesion was preceded by a pre-thrombotic state on every occasion and was accompanied by constitutional signs and symptoms. It occurred later on the average, approximately ten days after the delivery.

Consistent associated factors were varicose veins, toxæmia of pregnancy and manipulative interference at delivery or operative obstetrics. There were 86 patients in the total series, and of those 35 were reported to have suffered from varicose veins, 37 showed evidence of toxæmia of pregnancy

of moderate severity at some period during pregnancy, and 37 were subjected to manipulative interference or some form of operative procedure during the delivery.

The average age of the 86 patients was just under thirty years, which was about four years greater than the average age of patients confined at the hospital in one year. It was found that 68% of the patients affected were multiparous. The typical patient therefore who was most likely to fall a victim to thrombosis was a *multipara* of thirty years of age who had varicose veins of the lower extremities, had suffered with toxæmia of pregnancy and had had some form of operative obstetrical procedure at her confinement. That patient might exhibit a superficial thrombus a few days after delivery. Ten days later a deep thrombus might develop in the deep femoral or iliac veins, especially if preceded by a period of infection. That patient then became a likely candidate for the addition of pulmonary thrombo-embolic vascular lesions.

Dr. McGarrity then pointed out that the intravascular conditions which favoured thrombosis were tissue necrosis, infection, venous stasis and liver damage. Those were all likely to develop in obstetrics in cases in which varicosities or toxæmia of pregnancy occurred and in which delivery was followed by pelvic infection. The indications for the introduction of anticoagulant therapy were (i) the development of a pre-thrombotic state, especially if in association with the conditions already mentioned, (ii) the presence of thrombophlebitis or phlebothrombosis, (iii) pulmonary thrombo-embolic conditions, and (iv) previously established intravascular thrombosis or embolism.

Dr. McGarrity next discussed the question of treatment and pointed out that Jorpes had shown that anticoagulants, as well as preventing the appearance of thrombosis in a susceptible patient, prevented the extension of such a lesion once it had formed and hastened its absorption when once established. The latter fact had been illustrated by a recent case which exhibited the features of *phlegmasia alba dolens* (massive intravenous thrombosis and accompanying lymphatic obstruction). The patient had the classical signs and symptoms of *phlegmasia alba dolens* following a left femoral thrombosis after a confinement. The leg was swollen to many times its normal size and was hard and very painful. Anticoagulant therapy was commenced on standard lines, and at the same time, to reduce the swelling and ease the pain, a lumbar sympathetic block was performed by injection of 20 millilitres of 1·5% "Metycaine" solution into the lumbar ganglia at the site of the third and fourth lumbar vertebræ. That relieved pain and the swelling within three-quarters of an hour. Three weeks later, after anticoagulant therapy, the leg was normal again, and even after walking the swelling did not reappear. The standard anticoagulant treatment followed the lines laid down by the Mayo Clinic, namely, heparin, 5000 units every four hours for five doses, and dicoumarol, 300 milligrammes on the first day and 200 milligrammes on the second day. The prothrombin index was kept at approximately 30% to 40% and the coagulation time at over six minutes as estimated by the open capillary tube method.

Medical Societies.

UNIVERSITY OF QUEENSLAND MEDICAL SOCIETY.

A Memorandum on Medical Education.

The following memorandum on medical education has been received from the University of Queensland Medical Society.

In an explanatory note which accompanied the memorandum it is stated that the Society has nominally as its members undergraduates and graduates of the Medical School of the University of Queensland. At the present time only very few graduates take any active part in the affairs of the Society. Thus the memorandum is wholly an undergraduate effort. Members concerned in its compilation have been aided and inspired by British and American medical educationalists. The Society records its thanks to: Dr. C. E. Dolman, head of the Department of Bacteriology and Preventive Medicine in the University of British Columbia, Vancouver; Dr. Robert S. Morison, of the Rockefeller Foundation, New York; Sir Hugh Cairns, Nuffield Professor of Surgery, Oxford; Professor J. C. Spence, Nuffield Professor of Child Health, Durham.

The memorandum is a public report and has been forwarded to the Senate of the University of Queensland.

Memorandum on the Need for a University Teaching Hospital at St. Lucia.

In 1948 a Subcommittee of the University of Queensland Medical Society was set up to investigate the desirability of a university teaching hospital at St. Lucia. The Subcommittee sought advice from leading medical educationalists in Australia, England and America, and this memorandum summarizes the investigations of the committee and its positive recommendations to the University of Queensland Medical Society. The Subcommittee requested the Chancellor to grant its members an interview to discuss the question.

Although the Chancellor was unable to grant this request, he advised the Subcommittee to present a report to the Senate, since this question is now being discussed by that body. This is the report of the Subcommittee.

Introduction.

The main fact which emerged from the wealth of advice that was received from overseas sources is that close cooperation between all departments of the Faculty must be secured and that the very core of the Faculty of Medicine is the teaching hospital under the complete control of the University and situated on the University campus.

1. Reasons Why There Must be Close Cooperation between All Departments of the Faculty.

The course provided by a medical faculty can be adequate only when there is a close relation between the preclinical studies of anatomy and physiology and the clinical studies of pathology, medicine and surgery.

After his preliminary studies of physics, chemistry and biology at the University, the student enters the School of Medicine and commences his study of anatomy or the structure of the body, both macroscopical and microscopical, and of physiology or the study of the function of the body. If the knowledge of the normal human body is to be complete, anatomy and physiology must be so interwoven that the student's thought processes encompass simultaneously the function and the structure of any particular system in the body. This is achieved only when the study of function is made at the same time as the studies of anatomy. If there is a separation in time of these two studies, there is a dissociation of the two thoughts, and such dissociation leads to an incomplete concept of the human body. Therefore the departments of anatomy and physiology must work in close collaboration, and this is facilitated when the same building houses both departments.

The study of anatomy at present begins, and unfortunately often ends, with the study of the preserved cadaver. But the purpose of this study is to reveal to the student the nature of the living tissues, and the tissues of the cadaver are often such that the nature of the living tissues is not understood from the appearance of preserved material. The most obvious example is the difference between the living fascia and the preserved fascia. Therefore the student of anatomy should see in the post-mortem room the structure of the recently dead tissues, which approximate to living tissues. This becomes impossible if anatomy is taught some miles from a post-mortem room of a hospital, and the concept of anatomy gained by the student is incomplete.

Similarly in physiology the student is taught to apply his knowledge of the normal function to the study of abnormal function. While normal function can be demonstrated in the bodies of the physiology students themselves, abnormal function is seen only in patients. If these are not available, the student gets a theoretical concept of clinical physiology which is unsatisfactory. To overcome the difficulty at present, the students visit a city hospital once per week and see demonstrated a physiological problem in a selected patient. If there were a teaching hospital, the week's lectures would not have to be didactic, but could be presented as clinical demonstrations, with obvious gain to the student.

The close correlation between departments becomes more urgent when the clinical years begin. In pathology the students find the constantly recurring question: "Is this abnormal?" No answer can be given unless the student understands thoroughly the normal. Now the student does not always know the normal structure, and this for two reasons. Firstly, he forgets his anatomy when he leaves the anatomy department, and secondly, some aspects of anatomy are not thought of until an abnormal condition has been seen, in the same way that the ramifications of a certain truth are not developed until an allied error has to be refuted. Therefore the student must return to the anatomy department and renew his ideas of the normal human body both macroscopical and microscopical. This can be done easily when the departments of pathology and anatomy are adjacent. It can be done with difficulty or not at all when these departments are miles apart.

When medicine and surgery are studied, a close cooperation between the departments is even more urgent, and this for two main reasons.

For the purposes of diagnosis, the student must have a clear concept of the pathology of the diseased organ or system. The lump in the patient's abdomen must be translated into a pathological process, and this translation requires an accurate memory of pathology. The memory must be rejuvenated by a visit to the pathology museum and to the micropathology department. If this visit is made, a clearer concept of the patient's disease is gained. If it is not made, the concept is vague. But the visit can be made only when the pathology department is near the hospital.

The essence of treatment is the reconstruction of a normal human body. Therefore it is essential that the student still possess a clear concept of the normal. This is gained by studying again his anatomy and physiology. These departments must therefore be adjacent to the hospital.

2. *Reasons Why the Hospital at which the Clinical Studies are Undertaken Should be a Teaching Hospital under University Control.*

The staff of any hospital has the duty of caring for the sick in the wards. The teaching hospital has a threefold function: (i) the care of the sick in the wards; (ii) the provision for the care of the sick of the future; (iii) the undertaking of research.

(i) It has been proved beyond doubt that the standard of patient care in a teaching hospital is not only equal to but higher than that in a hospital not designed for teaching.

(ii) This function is discharged when medical students are efficiently trained as doctors capable of treating the sick in the years to come. There are three ways in which this provision may be made:

(*a*) The students in their clinical years are attached to a visiting surgeon or physician at a public hospital and receive tuition from him by means of those patients under his care. He cannot select such patients as are suitable for teaching purposes, but must accept as his "clinical material" those patients admitted to his beds by a casualty medical officer. Many of these patients are not suitable for teaching purposes. This is the system which is established at the Brisbane General Hospital.

(*b*) The University through its Faculty of Medicine could have complete control of a certain number of beds in a particular hospital. The patients selected for these beds would be selected because they exhibit features which make them—to use an unfortunate term—suitable clinical material.

(*c*) The University could control its own hospital and again select patients for admission only because they are suitable for teaching purposes.

The weaknesses of the present system are all too obvious to need explanation. An itemized account will be all that is necessary to expose the unsatisfactory state of affairs. (i) Students do not form an essential link in the hospital arrangements of caring for the sick. (ii) Patients are not selected on the basis of being suitable for teaching purposes. (iii) The University has not complete control of the hospital beds that it requires for teaching purposes. (iv) The Brisbane General Hospital was not designed as a teaching hospital. It lacks (*a*) lecture rooms, (*b*) libraries, (*c*) reading rooms, (*d*) museums and (*e*) adequate common rooms for the students.

To quote several overseas authorities:

"The University must control hospital appointments and beds, or there'll be constant headaches."

"I tell you there is constant trouble unless there is the closest possible affiliation between the teaching hospital and the school of medicine, with the University in control."

"Unquestionably there should be no compromise on the issue of University control of the teaching hospital."

"There isn't any possibility of running a medical school on any other basis than that your Professors of Medicine and Surgery should be Chiefs of Staff of your teaching hospital and the proposition isn't worth five minutes' argument. There is no 'Class A' medical school where these arrangements do not obtain."

These quotations apply with equal force to dispel the second suggested arrangement (see (*b*) above), that of securing a certain number of beds in a teaching hospital controlled completely by the University.

Thus the first two possibilities are ruled out and the only method remaining which will lead to an adequate medical faculty is by the establishment of a teaching hospital under the control of the University. The negative arguments cited above may now be consolidated by offering the positive arguments for this University teaching hospital. (i) Only a university teaching hospital can properly select its patients for admission on the basis of suitability for teaching or research purposes. (ii) Only by building a new hospital can adequate facilities be provided for the efficient training of students. (iii) Only when all members of the staff are selected because they are teachers will the student reap the benefit of an excellent instruction. (iv) Finally, Harvey Cushing himself recognized as a *sine qua non* for teaching, that students be recognized "as a necessary part of a hospital organization".

3. *Reasons Why the Hospital Should be on the University Grounds.*

(*a*) In other centres, in America, in Melbourne and in Sydney, particularly, any other site has proved to be unsatisfactory. We should learn by their mistakes.

(*b*) Administration of the Faculty of Medicine presents enough serious problems for the University without aggravating the problem by remote control.

(*c*) Unless the hospital and the Medical School are adjacent there must be two separate pathology laboratories, two libraries, two museums, two sets of common rooms, two cafeterias, two sets of offices—all extravagant duplications.

(*d*) The essential cooperation between the various departments in the faculty as before outlined is made easy.

(*e*) Research in medicine requires cooperation not only between the faculty members, but also between the faculty and the physics department, if radioactivity as a form of therapy is to be investigated; and the chemistry and biology departments if a new drug is to be tried; and the applied science faculty if a new drug is to be manufactured economically; the story of penicillin and its manufacture on a large scale is an example of such cooperation. There is only one institution in this community where there are gathered together men of such diverse talents as are needed to investigate the problems of disease. This is the University. One does not need to defend the value to a school and to the community of medical research. A faculty of medicine which does not undertake research is a dead faculty.

(*f*) It has been the happy discovery of overseas universities that the hospital on the University grounds, although expensive, is the greatest asset the University possesses. For through it the rest of the University becomes known and respected. The University becomes part of the lives of the community who support it, and thus the University teaching hospital is of direct advantage to the State.

(*g*) A University teaching hospital at St. Lucia would have a large number of normal young Queenslanders with which to establish standards of normality, on which to demonstrate to the public the value of such new techniques as B.C.G. vaccination against tuberculosis, and through whom to spread improved standards of clean, wholesome living, eating, working and playing.

(*h*) A university health scheme embracing all students could be efficiently organized and the data from medical examinations analysed statistically to give normality standards for white adults under tropical and subtropical conditions.

(*j*) St. Lucia, when the bridge connecting it with West End is completed, will be in an excellent position to receive casualties and out-patients from many parts.

(*k*) If, as is hoped, Queensland is to have its own school of tropical medicine, it could be and should be incorporated in such a teaching hospital.

4. *Reasons which Involve the Whole Idea of a University.*

Thus far we have concerned ourselves with the more practical reasons for the establishment of a university teaching hospital. We must now embark on reasons which are basically philosophical, but no less real, and are of even more importance.

This University claims to provide a liberal education (calendar preamble to the Act to Incorporate and Endow the University). And this liberal education is intended not only for students in the liberal faculties of arts, but also for those in the faculties which train men for the professions. Now obviously in medicine there are taught no studies from which "nothing accrues of consequence beyond the using", to use Aristotle's definition of a liberal thing.

If the University is not making an idle boast that it will provide a liberal education, it must then believe that it is through the association with students who seek knowledge for its own sake that the medical student will come to apprehend "the great outlines of knowledge, the principles on which it rests, the scale of its parts, its lights and shades, its great points and its little".

The University must believe that it is because there are brought together in a place of universal learning "an assemblage of learned men, zealous for their own sciences

and rivals of each other", who adjust the claims and relations of their respective subjects for the sake of intellectual peace, and that born of this familiar intercourse is a clear atmosphere of thought, which the student also breathes, and from which he profits by the development of a habit of mind of which the "attributes are freedom, equitableness, calmness, moderation and wisdom". For this is the liberal education.

If, we repeat, the University is not making an idle boast that it will provide a liberal education for the students in the professional faculties, then the Faculty of Medicine must be at St. Lucia. And by the Faculty of Medicine is meant not the junior years, but the whole faculty, teachers, students in both preclinical and clinical years, demonstrators, research scholars—everyone. For this to be effected, there must be a teaching hospital at St. Lucia. If it be not effected, the University is one in name only. The idea of the University has been falsified. There is then no alternative. There can be no true university if medicine is excluded. The teaching hospital is an essential part of the University of St. Lucia.

Correspondence.

A NEW TUBERCULOSIS ACT IN TASMANIA.

SIR: With reference to your editorial in THE MEDICAL JOURNAL OF AUSTRALIA, Volume II, Number 13, dated September 24, 1949, regarding the *Tuberculosis Act*, 1949, of Tasmania, you state that it must be regarded "as a piece of experimental legislation, because of the fact that it is to expire on June 30, 1950". Whilst I agree with you that it is experimental, the reason is not because it is to expire on June 30, 1950.

The date of expiry was set by Parliament owing to a heated discussion of the question of pensions for persons suffering from tuberculosis, and the date was inserted solely to try to move the Commonwealth Government to grant higher pensions.

You further state that unless these payments are revised promptly "any conclusions drawn in June, 1950, will be worthless, and in the meantime hardship is being inflicted on those who cannot endure it".

May I point out that rational people who find themselves suffering from tuberculosis voluntarily ask for treatment, knowing that they will be placed on an inadequate pension. The hardship will only exist in about 2-3% of cases, *i.e.*, in those who refuse to consider their fellow beings and refuse to have free treatment. Every endeavour has been made by representations to the Commonwealth Minister for Health to have pensions for T.B. sufferers increased and I have been given to understand that that Government already has plans for increasing these benefits.

Yours, etc.,
R. J. DAVID TURNBULL,
Minister for Health.

Office of Minister for Health,
Hobart,
September 30, 1949.

THE CONTROL OF TUBERCULOSIS.

SIR: For the first time in forty years an intelligent and progressive move is afoot for the better control of tuberculosis in Australia. The Commonwealth has passed its *Tuberculosis Act*, 1948, and has formulated plans which are approved by the advisory council appointed under the Act. The advisory council is the strongest body of its kind which could be formed in Australia, and its recommendations surely must carry weight.

The agreement is that the actual work in the field is to be carried out by the State health departments, and the Commonwealth will supply the funds for any approved plans and for excess maintenance over the 1948 figure. This seems a fair and equitable arrangement, and needs only mutual agreement as between Commonwealth and States to ensure the success of a concerted attack on tuberculosis.

In June, 1948, at a conference of State health ministers, it was agreed that the Commonwealth should prepare uniform

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA FOR THE WEEK ENDED SEPTEMBER 24, 1949.[1]

Disease.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.[3]	Australian Capital Territory.	Australia.
Ankylostomiasis	*	2(2)	1	..	*	..	..	..	3
Anthrax	*	..	..	..	..	..	..	..	..
Beriberi	*	*	*	*	*	*	..	*	..
Bilharziasis	*	..	..	..	..	..	..	..	..
Cerebro-spinal Meningitis	4(3)	1(1)	..	..	1(1)	1	..	..	7
Cholera	..	..	..	..	..	..	..	..	..
Coastal Fever(*a*)	..	*	..	*	*	*	*	*	..
Dengue	*	*	*	*	*	*	..	*	..
Diarrhœa (Infantile)	..	..	8(8)	..	..	..	..	..	8
Diphtheria	12(6)	6(1)	5(1)	..	4(2)	..	..	..	27
Dysentery(*b*)	*	6(3)	..	..	1	..	..	..	7
Encephalitis Lethargica	..	..	..	..	..	..	..	..	..
Erysipelas	*	*	..	..	..	..	..	..	..
Filariasis	*	..	..	..	..	..	..	..	..
Helminthiasis	*	..	*	*	*	*	*	*	..
Hydatid	*	..	*	*	..	*	*	..	..
Influenza	*	*	*	..	*	*	..	*	..
Leprosy	..	..	..	..	..	..	..	..	..
Malaria(*c*)	*	(*c*)	1(*c*)	(*c*)	1(*c*)	(*c*)	(*c*)	(*c*)	2(*c*)
Measles	*	*	*	127(33)	*	*	..	..	127
Plague	..	..	..	..	..	..	..	..	..
Poliomyelitis	7(5)	33(21)	..	30(25)	..	1(1)	..	..	71
Psittacosis	*	..	*	..	*	*	*	*	..
Puerperal Fever	..	..	1(1)	1(1)	..	..	..	..	2
Rubella	..	*	6(2)	*	4(3)	*	..	..	10
Scarlet Fever	31(15)	15(7)	10(4)	8(3)	1	5(2)	..	..	70
Smallpox	..	..	..	..	..	..	..	..	..
Tetanus	*	..	2(1)	*	*	*	*	*	2
Trachoma	*	..	*	*	*	*	*	*	..
Tuberculosis(*d*)	23(22)	11(6)	30(23)	9(5)	18(9)	7(2)	..	..	98
Typhoid Fever(*e*)	..	..	..	..	..	..	..	..	..
Typhus (Endemic)(*f*)	1	..	1	..	..	..	..	..	2
Undulant Fever	..	1	..	1	..	..	..	..	2
Weil's Disease(*g*)	*	*	..	*	*	*	*	*	..
Whooping Cough	*	*	*	36(10)	*	*	..	..	36
Yellow Fever	..	..	..	..	..	..	..	..	..

[1] The form of this table is taken from the *Official Year Book of the Commonwealth of Australia*, Number 36, 1944-1945. Figures in parentheses are those for the metropolitan area.
[2] Figures not available.
[3] Figures incomplete owing to absence of returns from Northern Territory.
* Not notifiable.
(*a*) Includes "Moesman" and "Sarina" fevers. (*b*) Includes amœbic and bacillary. (*c*) Statistics inexact with varying practice with regard to relapses in Service cases infected overseas. (*d*) Includes all forms except in Northern Territory, where only pulmonary tuberculosis is notifiable. (*e*) Includes enteric fever, paratyphoid fevers and other Salmonella infections. (*f*) Cases reported include scrub, murine and tick typhus. (*g*) Includes leptospiroses, Weil's and para-Weil's disease.

legislation for submission to the States, so that they might have something tangible to work upon. This draft legislation was to contain certain compulsory clauses, which had been agreed upon at the officers' conference.

In August, 1948, at a Premiers' conference, it was agreed that the States accept the Commonwealth's proposals and pass legislation necessary to implement it.

At the present time only two States have passed the necessary legislation, and the scheme is in danger of falling through for this reason. The British Medical Association can hardly do other than support the Commonwealth's proposals, seeing that in its opposition to the *Pharmaceutical Benefits Act* it has stated repeatedly that it considered the Commonwealth could make much better use of its money in other ways, such as by instituting a concerted attack on tuberculosis.

The present position is a curious and disturbing one in that Commonwealth plans are being held up because State governments have failed to bring in the necessary legislation which they promised to do.

Yours, etc.,

D. R. W. Cowan.

163 North Terrace,
Adelaide,
October 3, 1949.

Medico-Legal.

PHARMACEUTICAL BENEFITS ACT, 1947–1949.

The High Court has held that Section 7A of the *Pharmaceutical Benefits Act*, 1947-1949, is invalid and has overruled the Commonwealth Government's demurrer with costs.

Obituary.

DAVID LESLIE YOFFA.

We regret to announce the death of Dr. David Leslie Yoffa, which occurred on September 1, 1949, at Melbourne.

JOHN GRANGER.

We regret to announce the death of Dr. John Granger, which occurred on September 22, 1949, at Gladesville, New South Wales.

Royal Australasian College of Surgeons.

OPEN MEETINGS.

The New South Wales State Committee of the Royal Australasian College of Surgeons invites all members of the medical profession to attend the following meetings.

On Wednesday, October 26, 1949, at 8.15 p.m., in the Stawell Hall, 145 Macquarie Street, Sydney, Dr. F. Duval and Dr. V. M. Coppleson will speak on "The Treatment of Carcinoma of the Breast". The discussion will be opened by Dr. E. W. Frecker and Dr. B. T. Edye.

On Monday, October 31, 1949, at 8.15 p.m., in the Stawell Hall, Keith Lyle, M.A., M.D., M.Chir. (Cantab.), M.R.C.P. (London), F.R.C.S. (England), of London, will speak on "Ocular Palsies in Intracranial Disease".

Australian Medical Board Proceedings.

QUEENSLAND.

The undermentioned have been registered, pursuant to the provisions of *The Medical Acts, 1939 to 1948*, of Queensland, as duly qualified medical practitioners:

Etteison, Eric Mendel, M.B., B.S., 1920 (Univ. Melbourne), General Hospital, Rockhampton.

Haynes, Elva Grace, M.B., B.S., 1946 (Univ. Sydney), c.o. Hospitals Board, Mackay.

Taylor, John Russell Robert, M.B., B.S., 1939 (Univ. Melbourne), 99 Charlotte Street, Wynnum.

The following additional qualification has been registered:

Yeates, Sidney Fergus Macrae, Ballow Chambers, Wickham Terrace, Brisbane, Diploma in Ophthalmology (Univ. Melbourne), 1949.

Diary for the Month.

Oct. 17.—Victorian Branch, B.M.A.: Finance, House and Library Subcommittee.
Oct. 18.—New South Wales Branch, B.M.A.: Medical Politics Committee.
Oct. 19.—Western Australian Branch, B.M.A.: General Meeting.
Oct. 20.—New South Wales Branch, B.M.A.: Clinical Meeting.
Oct. 20.—Victorian Branch, B.M.A.: Executive Meeting.
Oct. 25.—New South Wales Branch, B.M.A.: Ethics Committee.
Oct. 26.—Victorian Branch, B.M.A.: Council Meeting.

Medical Appointments: Important Notice.

Medical practitioners are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135 Macquarie Street, Sydney): Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phœnix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225 Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178 North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205 Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia. All government appointments with the exception of those of the Department of Public Health.

Editorial Notices.

Manuscripts forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to The Medical Journal of Australia alone, unless the contrary be stated.

All communications should be addressed to the Editor, The Medical Journal of Australia, The Printing House, Seamer Street, Glebe, New South Wales (Telephones: MW 2651-2.)

Members and subscribers are requested to notify the Manager, The Medical Journal of Australia, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this journal. The management cannot accept any responsibility or recognize any claim arising out of non-receipt of journals unless such notification is received within one month.

Subscription Rates.—Medical students and others not receiving The Medical Journal of Australia in virtue of membership of the Branches of the British Medical Association in the Commonwealth can become subscribers to the journal by applying to the Manager or through the usual agents and booksellers. Subscriptions can commence at the beginning of any quarter and are renewable on December 31. The rate is £3 *per annum* within Australia and the British Commonwealth of Nations, and £4 10s. *per annum* within America and foreign countries, payable in advance.